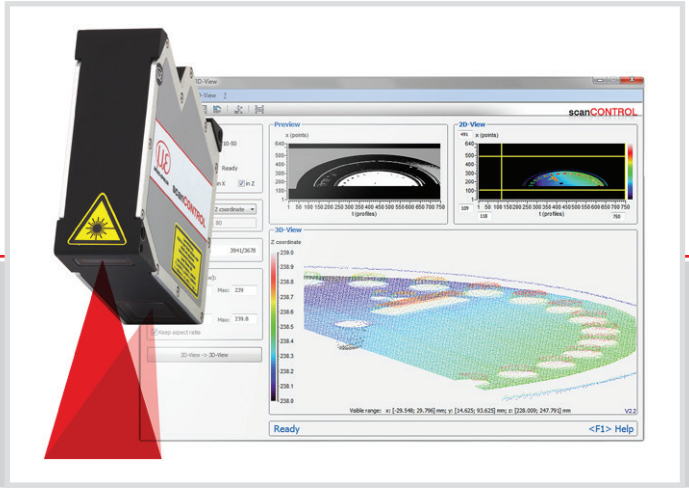
MICRO-EPSILON




# Instruction Manual

scanCONTROL 3D-View 2.4

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# 1. Introduction

This user manual will give you an overview of the functions of the software package scanCONTROL 3D-View.

scanCONTROL 3D-View offers you a three-dimensional visualization of point data which have been recorded with the scanCONTROL measurement system. Additionally, 3D-View provides the possibility to export and save the visualized data for later offline analysis.

The scanCONTROL measurement system acts as a basis for scanCONTROL 3D-View. scanCONTROL is a high speed sensor which is designed for applications in industrial environments. It is characterized by high measurement speed and accuracy.

3D-View supports the following scanCONTROL measurement systems:

- scanCONTROL 2600-25/2610-25/2650-25/2660-25
- scanCONTROL 2600-50/2610-50/2650-50/2660-50
- scanCONTROL 2600-100/2610-100/2650-100/2660-100
- scanCONTROL 2700-25/2710-25/2750-25/2760-25
- scanCONTROL 2700-50/2710-50/2750-50/2760-50
- scanCONTROL 2700-100/2710-100/2750-100/2760-100
- scanCONTROL 2800-10/2810-10
- scanCONTROL 2800-25/2810-25
- scanCONTROL 2800-100/2810-100
- scanCONTROL 2900-25/2910-25/2950-25/2960-25
- scanCONTROL 2900-50/2910-50/2950-50/2960-50
- scanCONTROL 2900-100/2910-100/2950-100/2960-100

**Note:** In the following the term scanCONTROL stands for all measurement systems listed above.

## 1.1 Use of the Manual

The user manual contains all the information for the installation and application of scanCONTROL 3D-View.

As a user of the software read Chapter 2 "Installing and preparing for measurement operation". Chapter 3 "Working with scanCONTROL 3D-View " explains how the software functions are used.

**Note:** For questions and advice as well as further technical information please contact your nearest Micro-Epsilon office. Details can be found at www.micro-epsilon.com

## 1.2 Functional Scope of scanCONTROL 3D-View

scanCONTROL 3D-View transfers profile data in a simple way from the scanCONTROL measurement system and presents it three-dimensionally. The data is transferred either via IEEE1394 (FireWire, iLink) or via Ethernet, depending on the type of sensor. Data, which has been saved with scanCONTROL 3D-View, scanCONTROL Configuration Tools, scanCONTROL Demo-Software, scanCONTROL Setup-Software 2X10 or DeveloperDemo (from Version 2.0), can be loaded and visualized.

scanCONTROL 3D-View offers the possibility of saving the 3D data for later offline analysis and of exporting the data in a variety of standard formats. A full screen mode and a print function are available for the detailed viewing of 3D data. The loading and saving of parameters simplifies working with different objects and settings.

The detailed functional scope of scanCONTROL 3D-View is listed below:

- Data transfer via scanCONTROL (online mode)
- Load saved profile sequence (offline mode)
- 3D visualization
- Configure scanCONTROL
- Synchronization (triggered mode)
- Filter functions
- Restore factory settings
- Full screen mode
- Print function
- Load and save parameters
- Load scanCONTROL parameters offline
- Save profile sequences
- Export images
- Export 3D data

## 1.3 Definition of Terms for Profile, Profile Sequence and Point Cloud

The terms "profile", "profile sequence" and “point cloud” are used repeatedly in this manual in the context of the software, and are defined as follows:

A "profile" consists of a maximum of 1280 individual measurement points, each of which is defined by a X coordinate and a Z coordinate (two-dimensional).

A chronologically consecutive series of profiles is called a "profile sequence". All points located in a profile sequence are also designated as a "point cloud". Each of these points is defined by its X, Y/T and Z coordinates (three-dimensional), whereby the Y/T coordinates arise from the chronological offset in the individual profiles (refer to Chapter 3.10).

# 2. Installation and Preparation for Measurement Operation

## 2.1 Installation Requirements

The following minimum system specification is necessary for the operation of scanCONTROL 3D-View:

- Windows XP SP2 (32 bit), Windows Vista (32 bit), Windows 7 (32 bit and 64 bit), Windows 8 or 8.1 (32 bit and 64 bit)
- Pentium III ≥ 800 MHz
- 512 MB RAM
- Screen resolution: 1024 x 768

To be able to use scanCONTROL 3D-View the following steps must be followed:

1. Install the IEEE 1394 and the Ethernet interface hardware respectively, if not already installed.
2. Install scanCONTROL 3D-View (refer to Chapter 2.3).
3. Connect the scanCONTROL measurement system to the PC via IEEE1394 and Ethernet respectively.
4. Install the driver for the scanCONTROL measurement system (only for IEEE1394, refer to Chapters 2.6, 2.7, 2.8 and 2.9).

| | |
|---|---|
| [CD]:\Documentation | Contains manuals, installation instructions and Quick Reference. |
| [CD]:\Program\scanCONTROL | Contains the following software packages: scanCONTROL Configuration Tools 4.0 scanCONTROL 3D-View 2.4 |
| [CD]:\Program\DeveloperDemo | Demo program for scanner setting and visualization of profile data. |
| [CD]:\Examples | Contains examples of profile sequences. |
| [CD]:\Development | Contains a SDK for integrating scanCONTROL in C and C++. |
| [CD]:\Support\Ethernet | Contains a software tool for configuration of the IP addresses of scanCONTROL devices with an Ethernet interface. |
| [CD]:\Support\Driver-CMU1394 | Contains the driver files (version 6.4.6) for the scanCONTROL measurement system. |
| [CD]:\Support\Adobe Reader 10 | Contains Adobe Reader 10. |
| [CD]:\Support\Perl | Contains Active Perl 5.6.1.633. |
| [CD]:\Support\FImageFilter | Contains filter files for integrating DirectX. |
| [CD]:\Support\Sentinel System Driver 7.5.0 | Contains the dongle driver. |
| [CD]:\Support\VCRedist | Contains the "Microsoft Visual C++ 2008" Redistributable Package |

*Fig. 2.1: Content of the scanCONTROL Software CD 8.0*

## 2.2 Technical Requirements

In order to be able to operate the scanCONTROL measurement system with scanCONTROL 3D-View, scanCONTROL needs a firmware version >= 17. Check, if necessary, the firmware version in the status line (refer to Chapters 3.3 and 5.3). The type of sensor "LLT2800-25 (003)v17-C2" contains a valid firmware version, for example.

## 2.3 Installation of the Software

When you insert the Software CD an installation window appears which offers you a number of options. Alternatively you can start the window with the [CD]:\setup.exe file.

Before you start to install the software, please check the following (only for IEEE1394, only for Windows 7, Windows Vista and Windows XP):

- The scanCONTROL measurement system must **not** be connected to the computer.

➪ Click on the "Install" button to start installing the software.

Now the installation wizard installs the software and necessary components.

**Note:** You need administrator rights in order to install the software and the driver for the scanCONTROL measurement system (only IEEE1394).

**Note:** For scanCONTROL measurement systems with an IEEE1394 interface, activate the "Disable default windows driver for IEEE1394 imaging devices" option to make the scanCONTROL driver installation easier.

**Note:** For scanCONTROL measurement systems with an Ethernet interface, activate the "Configure windows firewall" option in order to enable the data transfer between scanCONTROL and the PC in case of an active windows firewall.

During the installation process the driver for scanCONTROL will be installed (only IEEE1394, only Windows 8, see Chapter 2.6). You may be requested to restart the computer.

## 2.4 Connecting scanCONTROL to the PC (Ethernet)

In order to connect scanCONTROL via Ethernet to the PC, proceed as follows:

- Finish the installation of scanCONTROL 3D-View completely. This procedure is described in Chap. 2.3.
- Connect scanCONTROL via the Ethernet interface to the PC and switch on the power supply.
- Please wait until the device is recognized by the PC. This may take a few seconds.

The system is now ready to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

**Note:** scanCONTROL must be connected directly with the PC. Do not use hubs or switches.

**Note:** In case of using a network adapter which supports the "VLAN" option, this option must be inactive in order to use the scanCONTROL measurement system.

**Note:** The PC and the measurement system must be located in the same subnet in order to operate the scanCONTROL measurement system with 3D-View. Use the "Ethernet configurator" dialog box (see Chapter 3.17) in order to adjust the network settings of the measurement system, if necessary.

## 2.5 Connecting scanCONTROL to the PC (IEEE1394)

In order to connect scanCONTROL via IEEE1394 to the PC, proceed as follows:

Using Windows 8:

- Connect scanCONTROL via the IEEE1394 interface to the PC and switch on the power supply.
- Start the installation of scanCONTROL 3D-View. This procedure is described in Chap. 2.3.
- During the installation process the driver for scanCONTROL will be installed (see Chapter 2.6).

Using Windows 7, Windows Vista or Windows XP:

- Finish the installation of scanCONTROL 3D-View completely. This procedure is described in Chap. 2.3.
- Connect scanCONTROL via the IEEE1394 interface to the PC and switch on the power supply.
- Install the driver for scanCONTROL (see Chapter 2.7, 2.8 and 2.9).

The system is now ready to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

**Note:** You need administrator rights in order to install the driver for the scanCONTROL measurement system.

## 2.6 Installation of the Driver for IEEE1394 on Windows 8

**Note:** The driver only has to be installed for using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

Preparing the installation:

➡ Start the installation of scanCONTROL 3D-View. This procedure is described in Chapter 2.3.

During the installation process you will be requested to connect scanCONTROL to the PC (see Fig. 2.2).

Installation of scanCONTROL driver
In case of using scanCONTROL measurement systems with an Ethernet interface, press "Continue" in order to proceed with the installation.
In case of using scanCONTROL measurement systems with an IEEE1394 interface, connect them with the PC now and press "Continue" in order to install the driver for the measurement systems.
Continue ->
Cancel

*Fig. 2.2: Windows 8 automatic driver installation - step 1*

➡ Connect scanCONTROL to the PC and click on ”Continue” to confirm (see Fig. 2.2).

First, the driver files will be installed. A dialog is displayed during this process (see Fig. 2.3):

*Fig. 2.3: Windows 8 automatic driver installation - step 2*

The "Windows Security" dialog appears:

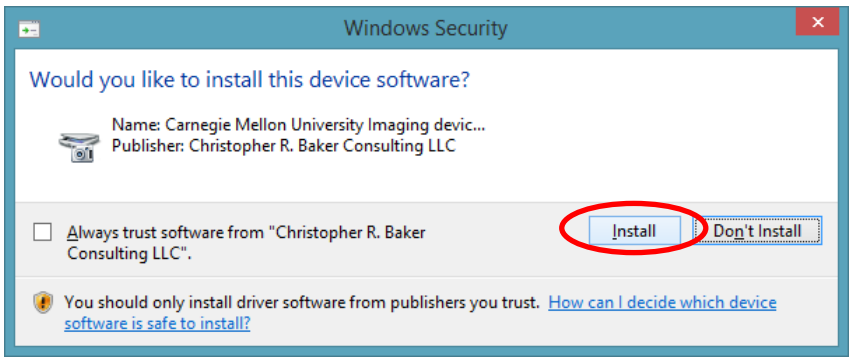
Windows Security
Would you like to install this device software?
Name: Carnegie Mellon University Imaging devic...
Publisher: Christopher R. Baker Consulting LLC
Always trust software from "Christopher R. Baker Consulting LLC".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

*Fig. 2.4: Windows 8 automatic driver installation - step 3*

➡ Click on ”Install” to confirm this dialog (see Fig. 2.4).

Now, the installation of the driver will be finished. After completing the installation of the driver the installation of 3D-View will be continued.

If you want to install the driver at a later date or in case of an incorrect installation of the driver, you may install the driver for scanCONTROL subsequently. This procedure is described in Chapter 5.4.1.

You also have the possibility to install the driver manually. This procedure is described in Chapter 5.4.2.

**Note:** Only use version 6.4.6 of the CMU driver which is delivered on the CD. If a different driver or a different version of the CMU driver for scanCONTROL is installed later, it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

## 2.7 Installation of the Driver for IEEE1394 on Windows 7

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

Preparing the installation:

➡ Finish the installation of scanCONTROL 3D-View completely. This procedure is described in Chapter 2.3.
➡ Connect scanCONTROL via the IEEE1394 interface to the PC.
➡ Switch on scanCONTROL and the power supply.

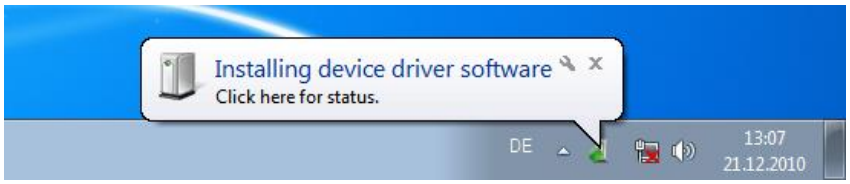


*Fig. 2.5: Windows 7 automatic driver installation - step 1*

The operating system automatically installs the driver for scanCONTROL. The installation process is displayed in the task bar (see Fig. 2.5). The following message is displayed after completing the installation successfully (see Fig. 2.6):

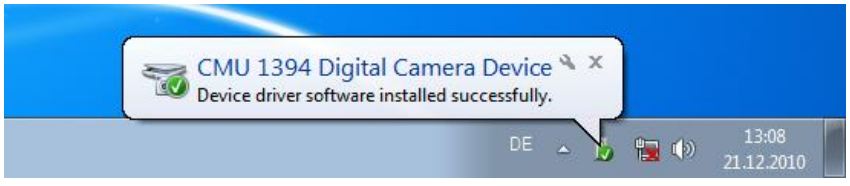


*Fig. 2.6: Windows 7 automatic driver installation - step 2*

In case of an incorrect installation of the driver, you have to install the driver manually. This procedure is described in Chapter 5.4.3.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

## 2.8 Installation of the Driver for IEEE1394 on Windows Vista

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

Preparing the installation:

- Finish the installation of scanCONTROL 3D-View completely. This procedure is described in Chapter 2.3.
- Connect scanCONTROL via the IEEE1394 interface to the PC.
- Switch on scanCONTROL and the power supply.

The installation dialog will then appear on the screen.

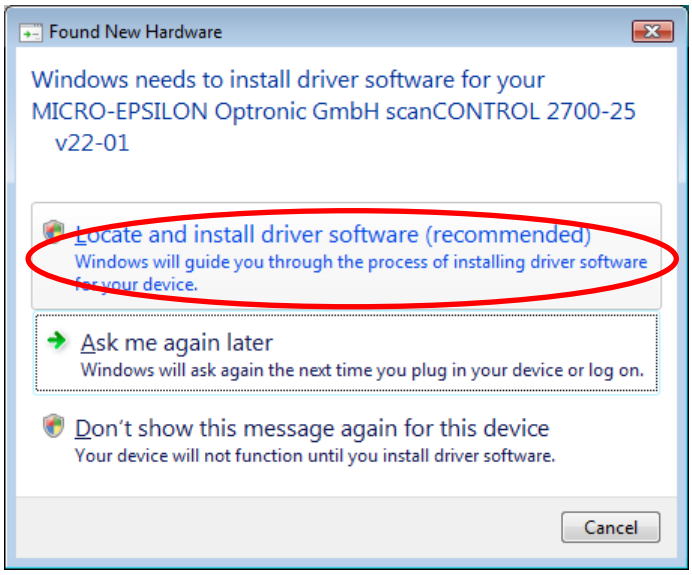
Found New Hardware
Windows needs to install driver software for your
MICRO-EPSILON Optronic GmbH scanCONTROL 2700-25
v22-01
Locate and install driver software (recommended)
Windows will guide you through the process of installing driver software for your device.
Ask me again later
Windows will ask again the next time you plug in your device or log on.
Don't show this message again for this device
Your device will not function until you install driver software.
Cancel

*Fig. 2.7: Windows Vista automatic driver installation - step 1*

- Select "Locate and install driver software (recommended)" (see Fig. 2.7).

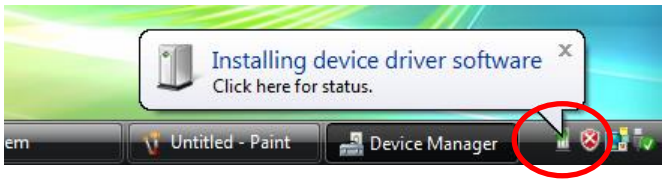


*Fig. 2.8: Windows Vista automatic driver installation - step 2*

Now the operating system installs the driver for scanCONTROL. The installation process is displayed in the task bar (see Fig. 2.8) and may take a few minutes.

The "Windows Security" dialog appears:

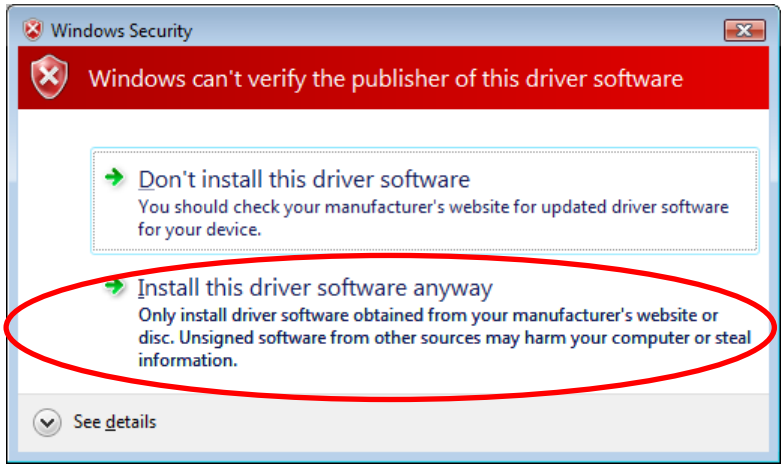
Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

*Fig. 2.9: Windows Vista automatic driver installation - step 3*

➡ Select "Install this driver software anyway" in this dialog (see Fig. 2.9).

The system completes the installation of the driver now. The following message is displayed after completing the installation successfully (see Fig. 2.10):

*Fig. 2.10: Windows Vista automatic driver installation - step 4*

In case of an incorrect installation of the driver, you have to install the driver manually. This procedure is described in Chapter 5.4.4.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

## 2.9 Installation of the Driver for IEEE1394 on Windows XP

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

Preparing the installation:

- Finish the installation of scanCONTROL 3D-View completely. This procedure is described in Chapter 2.3.
- Connect scanCONTROL via the IEEE1394 interface to the PC.
- Switch on scanCONTROL and the power supply.

The "Found New Hardware Wizard" dialog will then appear on the screen.

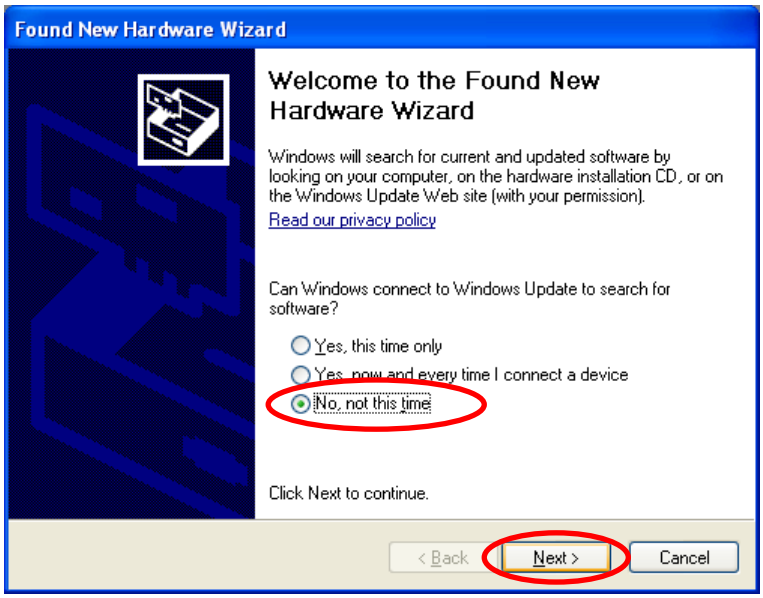
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

*Fig. 2.11: Windows XP automatic driver installation - step 1*

- Select ”No, not this time” and click on ”Next” to confirm (see Fig. 2.11).

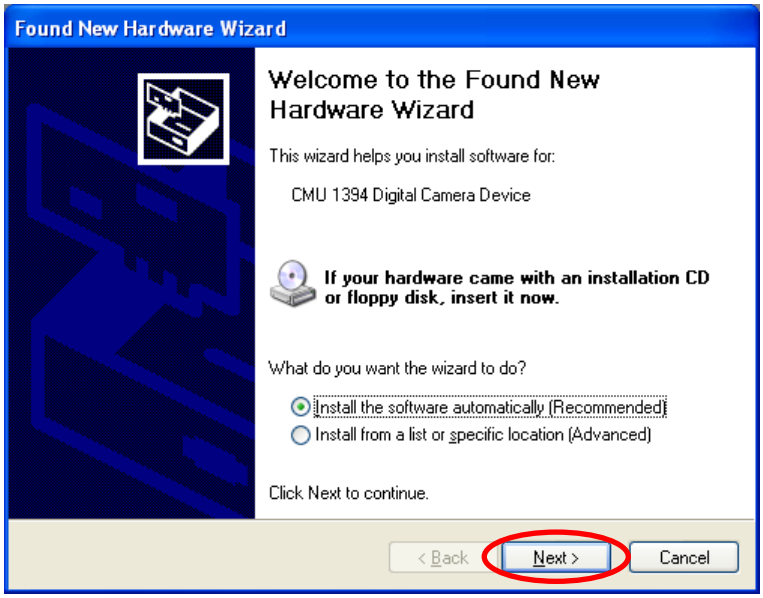
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
CMU 1394 Digital Camera Device
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

*Fig. 2.12: Windows XP automatic driver installation - step 2*

- Click on ”Next” to confirm this dialog (see Fig. 2.12).

Now the operating system installs the driver for scanCONTROL. The ”Hardware installation” dialog will appear.

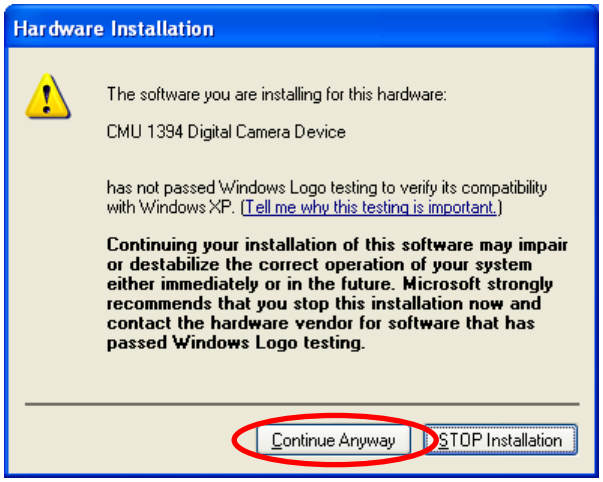
Hardware Installation
The software you are installing for this hardware:
CMU 1394 Digital Camera Device
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

*Fig. 2.13: Windows XP automatic driver installation - step 3*

➨ Click on ”Continue anyway” to confirm this dialog (see Fig. 2.13).

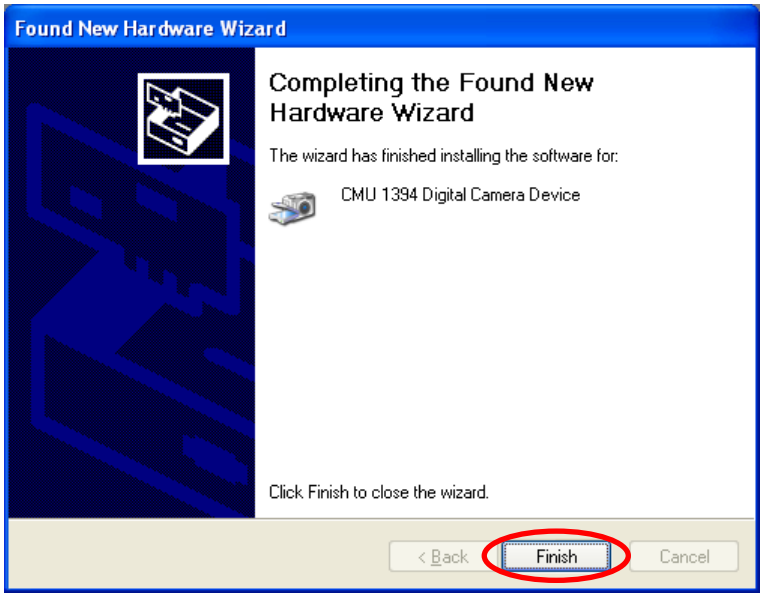
Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
CMU 1394 Digital Camera Device
Click Finish to close the wizard.
< Back
Finish
Cancel

*Fig. 2.14: Windows XP automatic driver installation - step 4*

➨ Click on ”Finish” in the next dialog (see Fig. 2.14).

The scanCONTROL driver is now installed.

In case of an incorrect installation of the driver, you have to install the driver manually. This procedure is described in Chapter 5.4.5.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

# 3. Working with scanCONTROL 3D-View

## 3.1 Operation Modes

Depending on the selected data source scanCONTROL 3D-View provides two different operation modes:

| Data source | Description |
|---|---|
| scanCONTROL (online mode) | The scanCONTROL measurement system acquires measurement data and transfers them to the PC. scanCONTROL 3D-View visualizes the measurement results. |
| File (offline mode) | The software plays back a saved profile sequence and visualizes the measurement results. |

## 3.2 Starting the Software

➡ Once the installation of the software and driver is completed, you can start the software. For this, use the program link on your desktop or the start menu entry "scanCONTROL 3D-View 2.4".

After you have started the program, the main view of scanCONTROL 3D-View appears (refer to Fig. 3.1).

**Note:**

- Never disconnect the IEEE1394 connection between the scanCONTROL and the computer while the software is running.
- Never switch off the power supply of scanCONTROL while the software is running.
- Never press the reset/user mode button on the controller (scanCONTROL 2800/2810) while the software is running.
- Never activate the standby mode or shut down status of your computer when the measurement system is connected to the computer.

This may cause the operating system to shut down unintentionally.

## 3.3 Description of the Main View

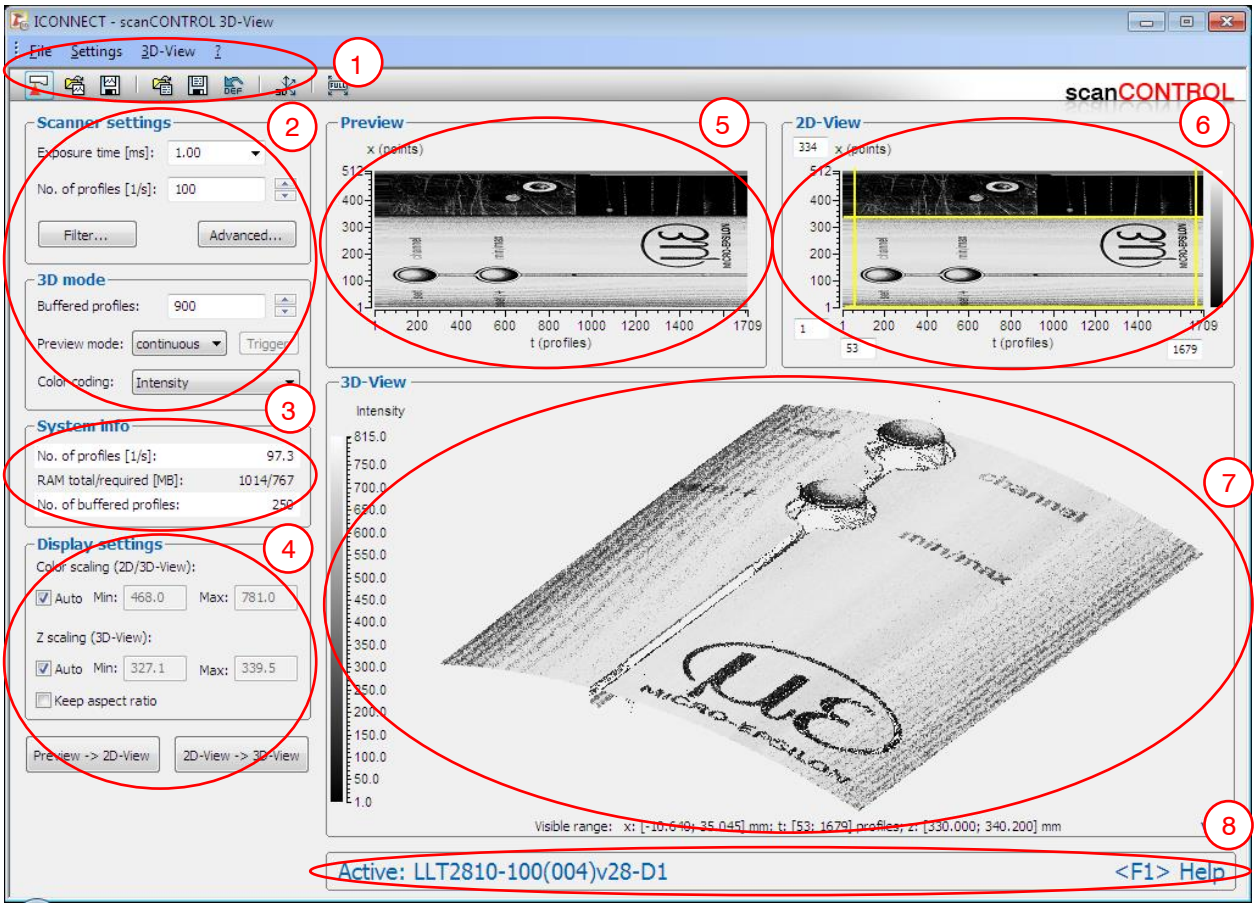


*Fig. 3.1: Main view*

In the upper section of the main view you will find the menu bar and the toolbar (refer to Fig. 3.1, ①) which you can use for activating various dialog boxes of settings and views (see Chapter 3.16).

In the upper left section of the main view (refer to Fig. 3.1 ②), depending on the operation mode (online/offline mode), you can either change settings on the scanCONTROL measurement system, or visualize previously saved profile sequences (refer also to Chapter 3.4 or 3.5). Below the "3D mode" box there is an information field ③, in which the current system status is shown (refer to Chapter 3.11). In the lower left section you configure the settings for the display (refer also to Chapter 3.7). In the right section there are the preview window ⑤ (refer to Chapter 3.8), the 2D-View ⑥ (refer to Chapter 3.9) and the 3D-View ⑦ (refer to Chapter 3.10).

In the lower section of the main view there is the status line (refer to Fig. 3.1, ⑧). Status and error messages are displayed. For a complete list of the possible messages please refer to Chapter 5.3.

## 3.4 Online Mode

**Note:** In order to be able to operate the scanCONTROL measurement system with scanCONTROL 3D-View, scanCONTROL needs a firmware version >= 17. Check, if necessary, the firmware version in the status line (refer to Chapter 5.3). The type of sensor "LLT2800-25 (003)v17-C2" contains a valid firmware version, for example.

After starting the software scanCONTROL 3D-View is in online mode. In online mode data from the scanCONTROL measurement system is transferred directly to the PC and visualized by the software.

If you are in offline mode, you can activate the online mode either by selecting the "File → scanCONTROL" menu item or by pressing the corresponding button in the toolbar (refer to Fig. 3.2).

Use the "Scanner settings" box to configure the measurement system.

*Fig. 3.2: "scanCONTROL" button*

### 3.4.1 Description of the "Scanner settings" and the "3D mode" Box

Use the parameters in these boxes to configure scanCONTROL for your measuring task.

**Note:** The parameters "Exposure time"/"No. of profiles" are dependent on each other. Thus with setting the parameter "No. of profiles" to 50 profiles per second the maximum value for "Exposure time" is 20 ms, for example.

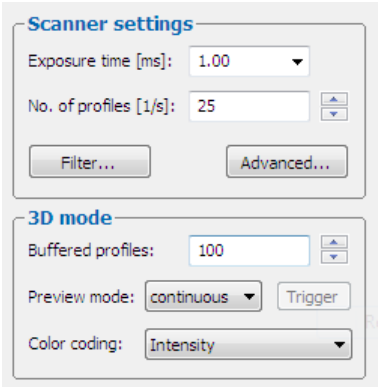


*Fig. 3.3: "Scanner settings" and "3D mode" boxes*

You enter the following settings:

- **Exposure time [ms]:** With this parameter you select the exposure time for the scanner.
  - Minimum value: 0.01 ms.
  - Maximum value: 40.0 ms.
- **No. of profiles [1/s]:** This parameter controls the number of profiles which are acquired per second and transferred to the PC. This value has priority over the "Exposure time" parameter.
  - Minimum value: 25.
  - Maximum value: depends on the type of sensor:
    - **scanCONTROL 2600/2610/2900/2910:** 200
    - **scanCONTROL 2700/2710:** 100
    - **scanCONTROL 2650/2660/2750/2760/2800/2810:** 4000
    - **scanCONTROL 2950/2960:** 2000
- **Filter…:** With this button you access the "Filter settings" dialog box (refer to Chapter 3.13).
- **Advanced…:** With this button you access the "Advanced scanner settings" dialog box (refer to Chapter 3.4.2).

- **Buffered profiles:** This parameter defines the number of profiles that make up a point cloud, i.e. you determine the resolution in the Y/T direction with this parameter. The minimum adjustable value is 100. The maximum adjustable value depends on the following factors:
  - RAM/Paging file
  - Operating system/Architecture (32 bit/64 bit)
  - "Points per profile" parameter
  - "Profiles" and "Quality" parameters, located in the "Drawing method" input field (refer to Chapter 3.14)
- **Preview mode:** Use this parameter to select the type of data transmission.
  - **continuous:** The data is continuously transferred from scanCONTROL. The preview window is updated continuously.
  - **trigger:** Select this option to transfer a profile sequence from the scanner at a defined point in time. The scanCONTROL measurement system initially transfers no profiles. Start the data transfer with the "Trigger" button. scanCONTROL then acquires and transfers the measurement data to the PC. Once the number of profiles defined in the "Buffered profiles" entry field is reached, the transferred point cloud is visualized in the preview window and scanCONTROL stops the data transfer.
- **Color coding:** This value specifies which measurement data from scanCONTROL is used for the colored texture of the point cloud in the individual views. The selected information is evaluated for each single point in the point cloud and displayed in color. The following selections are available:
  - **Intensity:** The maximum intensity of the reflection.
  - **Z coordinate:** The Z coordinate.
  - **Width:** The width of the reflection.
  - **Threshold:** The threshold which was applied depending on the backlight in order to detect a reflection.
  - **Moment 0:** Zeroth order moment (the area of the reflection).
  - **Moment 1:** First order moment.

**Note:** The "Scanner settings" dialog box is available only in online mode!

**Note:** The elements of the "3D mode" box vary depending on the operation mode (Online/offline mode).

**Note:** For further information on the configuration of the measurement system, please refer to the instruction manual of the measurement system used and to the documents "Quick Reference scanCONTROL" and "Manual scanCONTROL (Part B)" (refer to Chapter 3.18).

**Note:** The default values for the parameters are listed in Chapter 5.5.

### 3.4.2 Description of the "Advanced scanner settings" Dialog Box

This dialog box offers you extended settings for the scanCONTROL measurement system.

**Note:** The parameters "Measuring field"/"Points per profile" are dependent on each other.

**Note:** Only experienced users of the scanCONTROL measurement system should change settings in this dialog box.

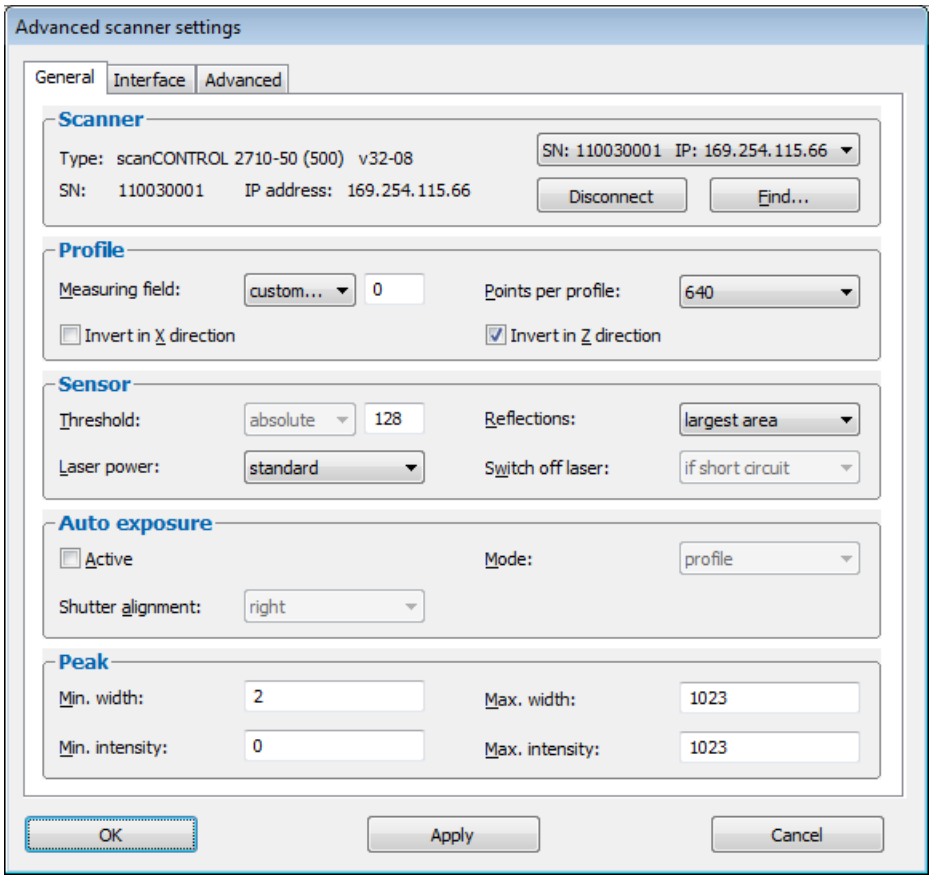


*Fig. 3.4: "General" tab sheet in the "Advanced scanner settings" dialog box*

- **Type:** The connected measurement system and its associated firmware version are displayed.
- **SN:** The serial number of the connected measurement system is displayed.
- **IP address:** In case of using scanCONTROL with an Ethernet interface, the IP address of scanCONTROL is displayed.
- **Scanner selection:** This list contains all scanCONTROL measurement systems connected to the PC via Ethernet and IEEE1394. Use this selection and the Connect/Disconnect button (see below) in order to activate a desired measurement system.
- **Connect/Disconnect:** Depending on the selection of the scanner list this button behaves as follows:
  - **Disconnect:** If the currently active measuring system is selected in the scanner selection, you may disconnect the measuring system using the "Disconnect" button.
  - **Connect:** If a measuring system is selected which isn't currently connected to 3D-View, you may use the "Connect" button in order to connect to the selected measuring system. In doing so, the previously connected measuring system gets disconnected.
- **Find...:** Press this button in order to identify all scanCONTROL measurement systems which are connected to the PC via Ethernet and IEEE1394. This function is performed automatically with starting the software. After completing this procedure the scanner selection list will be refreshed and you may change between the individual measurement systems.

- **Measuring field:** Select one of the values to set the measuring field of scanCONTROL. For detailed information please refer to the instruction manual of the measurement system used. The following values are available, depending on the type of sensor:
  - **scanCONTROL 26X0/27X0:**
    - **small:** Measuring field index 7, 640 x 120 pixels
    - **standard:** Measuring field index 2, 640 x 360 pixels
    - **large:** Measuring field index 0, 640 x 480 pixels
    - **custom...:** You can select the measuring field index (0 - 127).
  - **scanCONTROL 28X0:**
    - **small:** Measuring field index 95, 256 x 256 pixels
    - **standard:** Measuring field index 50, 512 x 768 pixels
    - **large:** Measuring field index 18, 768 x 768 pixels
    - **huge:** Measuring field index 0, 1024 x 1024 pixels
    - **custom...:** You can select the measuring field index (0 - 95).
  - **scanCONTROL 29X0:**
    - **small:** Measuring field index 7, 1280 x 256 pixels
    - **standard:** Measuring field index 2, 1280 x 768 pixels
    - **large:** Measuring field index 0, 1280 x 1024 pixels
    - **custom...:** You can select the measuring field index (0 - 127).

  With this entry you specify the resolution in the direction of the X and the Z axis. The value for the X axis is also influenced by the "Points per profile" box!
- **Points per profile:** This parameter defines the number of points that make up a profile. Depending on the type of sensor you can choose between the following values:
  - **scanCONTROL 26X0/27X0:**
    - **80**
    - **160**
    - **320**
    - **640**
  - **scanCONTROL 28X0:**
    - **64 (optional)**
    - **128 (optional)**
    - **256**
    - **512**
    - **1024**
  - **scanCONTROL 29X0:**
    - **160**
    - **320**
    - **640**
    - **1280**

  With this parameter you specify the resolution in the direction of the X axis. This value has priority over the entry in the "Measuring field" box but does not have any influence on the resolution in the direction of the Z axis.
- **Invert in X direction:** The signal is inverted on the Z axis.
- **Invert in Z direction:** The signal is inverted in the middle of the measurement range parallel to the X axis. This parameter is enabled in the default settings.
- **Threshold:** This value specifies the value of intensity at which the scanner recognizes a reflection.
  - **absolute:** The chosen threshold (0-1023) is used as absolute threshold.
  - **dynamic:** The chosen threshold (0-1023) is used as a percentage of the maximum intensity of a reflection (value[%] = 100*threshold/1024). If you want to use a threshold which corresponds to 25 % of the maximum intensity, for example, you have to set the threshold parameter to 256.

- **Reflections:** With this parameter you determine which reflection is detected as a profile point. This parameter is only important for multiple reflections.
  - **first:** The reflection closest to the scanner.
  - **last:** The reflection furthest away from the scanner.
  - **largest area:** The reflection with the largest area. This setting is enabled in the default settings.
  - **highest intensity:** The reflection with the highest intensity.
  - **only single:** The reflection is processed only if there is only a single reflection for this profile point.
- **Laser power [mW]:** You can operate the laser of scanCONTROL at two different power levels or switch it off. Depending on the type of sensor the following options are available:
  - **scanCONTROL 26X0/29X0:**
    - **off:** Laser is switched off.
    - **reduced:** 2 mW, if not specified otherwise.
    - **standard:** 8 mW, if not specified otherwise.
    - **reduced (pulsed):** pulsating with 2 mW, if not specified otherwise. This option is used to synchronize two scanCONTROL measurement systems with alternately pulsed lasers. The "RS422 mode" parameter must be set to "ext. trigger input" or "ext. trigger output".
    - **standard (pulsed):** pulsating with 8 mW, if not specified otherwise. This option is used to synchronize two scanCONTROL measurement systems with alternately pulsed lasers. The "RS422 mode" parameter must be set to "ext. trigger input" or "ext. trigger output".
  - **scanCONTROL 27X0:**
    - **off:** Laser is switched off.
    - **reduced:** 2 mW, if not specified otherwise.
    - **standard:** 10 mW, if not specified otherwise.
  - **scanCONTROL 28X0:**
    - **off:** Laser is switched off.
    - **reduced:** 1 mW, if not specified otherwise.
    - **standard:** 15 mW, if not specified otherwise.
- **Switch off laser:** With this parameter you configure the laser safety interlock of scanCONTROL depending on the protective circuit of pins 3 and 13 of the synchronous input (only for scanCONTROL 2800/2810).
  - **if left open:** The laser is switched off with the pins open.
  - **if short circuit:** The laser is switched off with the pins connected. This parameter is only effective for laser class 2M (IIM).
- **Auto exposure:** Use these parameters to configure the automatic exposure time control.
  - **Active:** Select this input field to activate the automatic exposure time control of the scanCONTROL measurement system. This setting is recommended for scanning single-colored, alternating surfaces.
  - **Mode:** Use this parameter to specify the algorithm for the automatic exposure time control
    - **raw data:** The automatic exposure time control is computed based on the raw data (Sensor matrix).
    - **profile:** The automatic exposure time control is computed based on the profile data.
    - **filtered profile:** The automatic exposure time control is computed based on the filtered profile data.
  - **Shutter alignment:** With this parameter you determine how the specified scan rate is maintained with active automatic exposure time control.
    - **center:** The intervals are in each case aligned to the center of the interval.
    - **right:** The intervals are in each case aligned to the end of the interval.
    - **left:** The intervals are in each case aligned to the start of the interval.
    - **none:** The intervals are not aligned.

- **Peak Min. width:** Minimum width of a reflection to be detected as a valid profile point.
- **Peak Max. width:** Maximum width of a reflection to be detected as a valid profile point.
- **Peak Min. intensity:** Minimum intensity of a reflection to be detected as a valid profile point.
- **Peak Max. intensity:** Maximum intensity of a reflection to be detected as a valid profile point.

**Note:** The "dynamic" option of the "Threshold" parameter is only available using a scanCONTROL 26X0 or 29X0 measurement system.

**Note:** The "raw data" option of the "Auto exposure - Mode" parameter is only available using a scanCONTROL 26X0 or 29X0 measurement system.

**Note:** The parameter "Switch off laser" is only available using the scanCONTROL 2800 or scanCONTROL 2810 type of sensor.

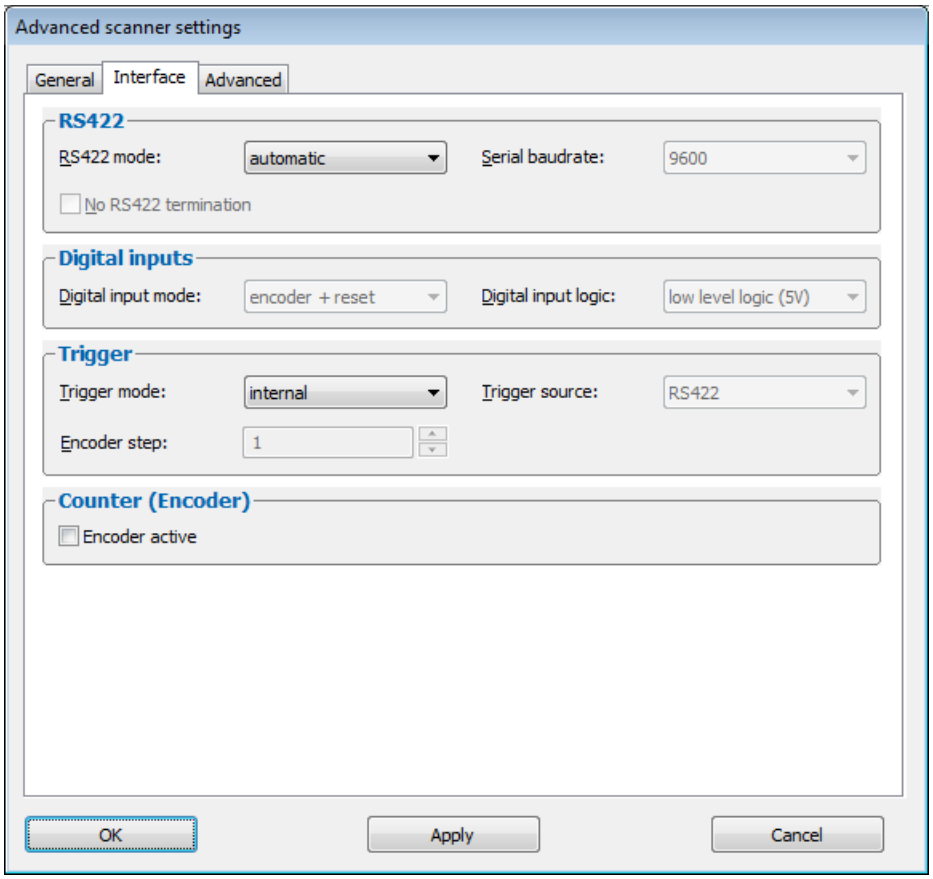


*Fig. 3.5: "Interface" tab sheet in the "Advanced scanner settings" dialog box*

- **RS422 mode:** Use this parameter to configure the function of the RS422 interface of scanCONTROL. Depending on the type of sensor you can choose between the following values:
  - **scanCONTROL 26X0/29X0**
    - **serial:** The RS422 interface is used as serial port. Commands are received.
    - **ext. trigger input:** The RS422 interface is used as synchronization and trigger input (see below, parameter "Trigger mode").
    - **ext. trigger output:** The RS422 interface is used as synchronization and trigger output.
    - **CMM trigger:** Activate this setting in order to use the RS422 interface as programmable trigger output (see below, parameter "Enable CMM trigger").

  - **scanCONTROL 27X0**
    - **automatic:** scanCONTROL configures the function of the RS422 interface automatically.
    - **serial:** The RS422 interface is used as serial port. Commands are received.
    - **external trigger:** The RS422 interface is used to synchronize and trigger the scanCONTROL measurement system (see below, parameter "Trigger mode").
    - **CMM trigger:** Activate this setting in order to use the RS422 interface as programmable trigger output (see below, parameter "Enable CMM trigger").
    - **encoder/counter:** Activate this function in order to access the internal counter of scanCONTROL via the RS422 interface (see below, input field "Counter (Encoder)").
    - **pulsed laser:** The RS422 interface is used to synchronize two scanCONTROL measurement systems. The lasers are alternately pulsed.
- **Serial baudrate:** Use this parameter to specify the baudrate at which the serial port operates. This parameter is only active in case of using the "serial" value for the "RS422" parameter.
  - **9600**
  - **19200**
  - **38400**
  - **57600**
  - **115200**
- **No RS422 termination:** Disables the termination resistor of the RS422 circuit. When deactivating this parameter, the default termination is used (serial: Termination active; ext. trigger input: Termination active; ext. trigger output: Termination inactive; CMM trigger: Termination inactive).
- **Digital input mode:** Use this parameter to configure the function of the digital inputs of scanCONTROL.
  - **encoder + reset:** Inputs 2 (A) and 3 (B) are used to access the internal counter of scanCONTROL. Input 1 (index N) is used to reset the counter.
  - **encoder + trigger:** Inputs 2 (A) and 3 (B) are used to access the internal counter of scanCONTROL. Input 1 is used as trigger input.
  - **trigger:** Input 1 is used as trigger input.
  - **user modes + trigger:** Input 1 is used as trigger input. Inputs 2 (bit 0) and 3 (bit 1) are used to load user modes.
  - **user modes:** Inputs 1 (bit 0), 2 (bit 1) and 3 (bit 2) are used to load user modes.
  - **timestamp:** The state of the digital inputs is included as bit sequence in the timestamp of the profiles.
- **Digital input logic:** Defines the logic of the digital inputs:
  - **low level logic (5V):** TTL
  - **high level logic (24V):** HTL
- **Trigger mode:** This function enables you to control the scanCONTROL measurement system via the RS422 interface (scanCONTROL 26X0/27X0/29X0), via the digital inputs (scanCONTROL 26X0/29X0) and via the synchronous input on the controller (scanCONTROL 28X0) respectively.
  - **internal:** scanCONTROL transfers continuously according to the setting "No. of profiles [1/s]"

  Please use the following trigger settings only when you control scanCONTROL externally:
  - **pos. edge:** scanCONTROL is triggered with positive edges whereas the exposure time corresponds to the parameter “Exposure time”.
  - **neg. edge:** scanCONTROL is triggered with negative edges whereas the exposure time corresponds to the parameter “Exposure time”.
  - **pos. pulse:** scanCONTROL is triggered with positive edges whereas the exposure time corresponds to the length of the positive trigger-pulse.
  - **neg. pulse:** scanCONTROL is triggered with negative edges whereas the exposure corresponds to the length of the negative trigger-pulse.
  - **pos. gate:** On applying a logical "1" signal to the trigger input scanCONTROL transfers continuously according to the setting "No. of profiles [1/s]“. When applying a logical "0" signal to the trigger input no profiles are transferred.
  - **neg. gate:** On applying a logical "0" signal to the trigger input scanCONTROL transfers continuously according to the setting "No. of profiles [1/s]“. When applying a logical "1" signal to the trigger input no profiles are transferred.
  - **encoder:** scanCONTROL is triggered using the internal counter (encoder). A measurement operation is triggered after N encoder steps (N is defined by the "Encoder step" parameter, see below).

**Note:** The maximum frequency available for triggering corresponds to the "No. of profiles [1/s]" parameter.

**Note:** More information about the trigger function of scanCONTROL can be found in the instruction manual of the measurement system used.

- **Trigger source:** Select the type of inputs used for synchronization and triggering:
  - **RS422**
  - **digital inputs**
- **Encoder step:** Specifies the number of encoder steps being necessary to trigger a measurement operation. This parameter is only available if the "Trigger mode" parameter is set to "encoder".
- **Counter (Encoder):** Use these parameters to activate the internal counter of scanCONTROL. With using a scanCONTROL 2800 or scanCONTROL 2810 measurement system, the counter input is only available as an option for scanCONTROL. You will find the effects of the counter input on the display in Chapter 3.10. Depending on the type of sensor the following parameters are available:
  - **scanCONTROL 26X0/27X0/29X0**
    - **Encoder active:** Activates the encoder input of scanCONTROL. It is possible to increment and decrement the counter.
  - **scanCONTROL 28X0**
    - **Count positve edges.** Activates the counter input of scanCONTROL. Ii is possible to increment the counter applying positive edges to the counter input.
    - **Count negative edges:** Activates the counter input of scanCONTROL. It is possible to increment the counter applying negative edges to the counter input.

**Note:** The "RS422 mode" parameter is only available using a scanCONTROL 26X0, 27X0 or 29X0 measurement system.

**Note:** The "pos. gate", "neg. gate" and "encoder" options of the "Trigger mode" parameter are only available using a scanCONTROL 26X0, 27X0 or 29X0 measurement system.

**Note:** The "No RS422 termination", "Digital input mode", "Digital input logic" and "Trigger source" parameters are only available using a scanCONTROL 26X0 or 29X0 measurement system.

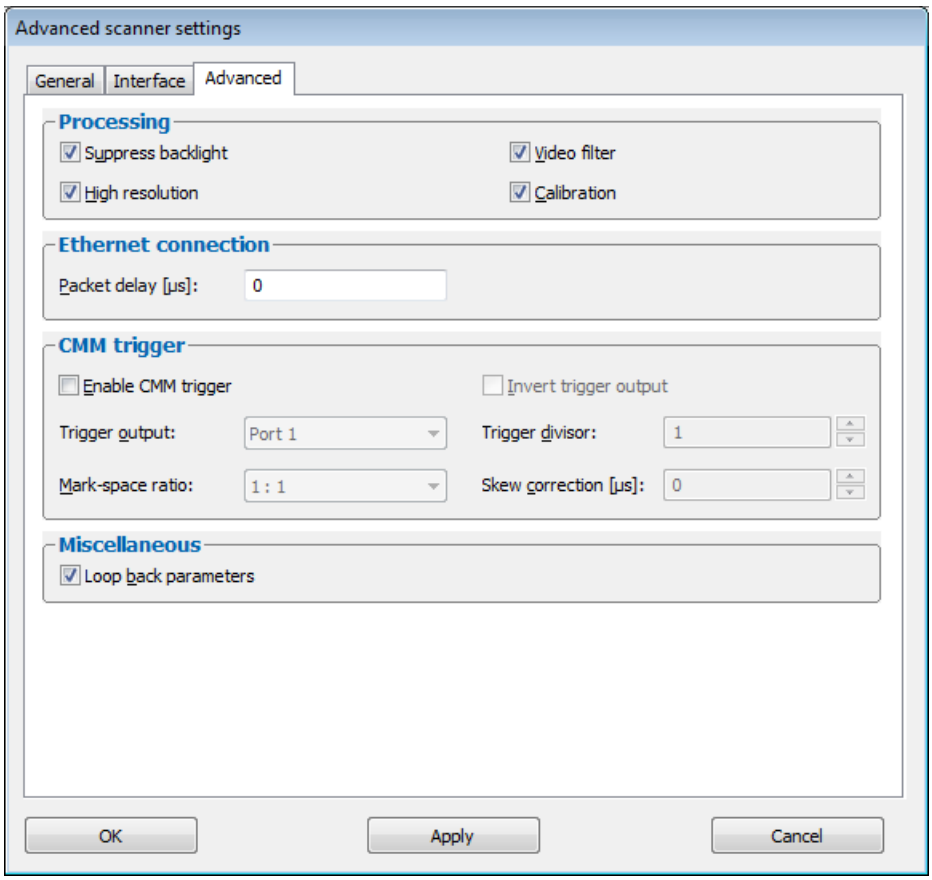


*Fig. 3.6: "Advanced" tab sheet in the "Advanced scanner settings" dialog box*

- **Suppress backlight:** Activate the automatic backlight compensation with this entry.
- **Video filter:** Activate this parameter to improve the image quality.
- **High resolution:** With this parameter you activate the subpixel resolution for the Z values.
- **Calibration:** Use this parameter to activate the calibration.
- **Packet delay [µs]:** Specifies the delay time of transferred data packets via Ethernet. This parameter is of importance in case of synchronizing multiple sensors in one subnet.
- **Enable CMM trigger:** Select this box to activate the programmable trigger output of scanCONTROL. With using a scanCONTROL 2800 measurement system, the programmable trigger output is only available as an option for scanCONTROL. This Parameter isn't available using a scanCONTROL 2810 measurement system.
- **Invert trigger output:** Invert the trigger output with this parameter.
- **Trigger output:** The port at which the trigger signal is issued.
  - **Port 1**
  - **Port 2**
  - **Port 3**
  - **Port 4**
- **Trigger divisor:** This gives the division ratio between the trigger signals and the profiles. Select a value "n" to issue one trigger signal for every nth profile.
  - **Min:** 1
  - **Max:** 255
- **Mark-space ratio:** This gives the mark-space ratio for the decreasing edge.
  - **1:4**
  - **1:3**
  - **1:2**
  - **1:1**
  - **2:1**
  - **3:1**
  - **4:1**
- **Skew correction [µs]:** This parameter provides a time correction of the trigger signal in increments of 0.5 µs.
  - **Minimum:** -256.0 µs
  - **Maximum:** 255.5 µs
- **Loop back parameters:** Activate the parameter loop back with this parameter. With saving a profile sequence (see Chapter 4.3) the scanCONTROL settings are saved in the profile file if "Loop back parameters" is activated and can then be displayed again later when you replay the profile file (see Chapter 3.5).

**Note:** Further information about the listed measurement system parameters can be found in the documents Quick Reference scanCONTROL and the scanCONTROL manual (Part B) (refer to Chapter 3.18).

**Note:** The default values for the parameters are listed in Chapter 5.5.

Confirm your settings with the "OK" button.

## 3.5 Offline Mode

scanCONTROL 3D-View enables you to load and visualize previously saved profile sequences. In offline mode the "Scanner settings" box is replaced by the "File" box.

In order to load and display profiles from a file offline, either select the “File → Load profiles” menu item or press the corresponding button (see Fig. 3.7) in the toolbar.

*Fig. 3.7: "Load profiles" button*

A standard Windows dialog is displayed where you select the path and file name. The profile sequence is loaded after confirmation of the dialog. The loaded profiles are shown in the preview window. The preview window is updated continuously.

### 3.5.1 Description of the "File settings" and the "3D mode" Box

Use the parameters in these boxes to visualize saved profile sequences in offline mode.

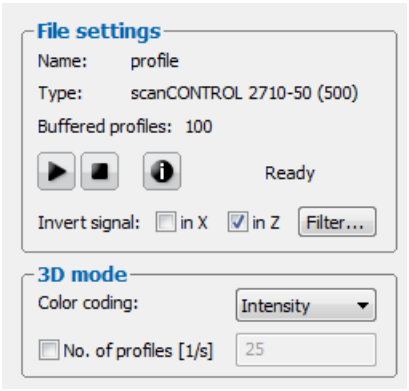


*Fig. 3.8: Settings in offline mode*

In the upper section of the box the following information of the loaded profile sequence is displayed:

- **Name:** Name of the profile sequence.
- **Type:** The type of the measurement system used for recording the profile sequence.
- **Buffered profiles:** The number of loaded profiles.

**Note:** The following software packages save the measurement system parameters:
- scanCONTROL 3D-View
- scanCONTROL Configuration Tools
- scanCONTROL Demo-Software (from Version 1.2)
- scanCONTROL Setup-Software 2X10
- DeveloperDemo (from Version 2.0, option must be activated).

The following settings are available:

- **Play:** This starts the playback of the previously loaded profile sequence. The loaded profiles are shown in the preview window. The preview window is updated continuously.
- **Stop:** This stops the playback of the profile sequence. The loaded profiles are shown in the preview window and the 2D-View.
- **Info:** You press this button to display the scanCONTROL settings selected when the profile sequence was saved (refer to Chapter 3.6).
- **Invert signal in X:** The signal is inverted on the Z axis. You must repeat playing back the profile sequence for the parameter to take effect.

- **Invert signal in Z:** The signal is inverted in the middle of the measurement range parallel to the X axis. You must repeat playing back the profile sequence for the parameter to take effect.
- **Filter…:** With this button you access the "Filter settings" dialog box (refer to Chapter 3.13).
- **Color coding:** This value specifies which part of the measurement data of the profile sequence is used for the colored texture of the point cloud in the individual views. The selected information is evaluated for each single point in the point cloud and displayed in color. The following selections are available:
  - **Intensity:** The maximum intensity of the reflection.
  - **Z coordinate:** The Z coordinate of the point.
  - **Width:** The width of the reflection.
  - **Threshold:** The threshold which was applied depending on the backlight in order to detect a reflection.
  - **Moment 0:** Zeroth order moment (the area of the reflection).
  - **Moment 1:** First order moment.

**Note:** The availability of the individual options depends on the settings used while saving the profile sequence.

**Note:** Further information about the possible selections can be found in the documents Quick Reference scanCONTROL and the scanCONTROL manual (Part B) (refer to Chapter 3.18).

- **No. of profiles [1/s]:** Here you specify the scan rate used for recording the profile sequence. If the parameters were recorded in the profile sequence ("Loop back parameters" active), the scan rate is automatically updated during the replay and the field is deactivated.

**Note:** The parameter “No. of profiles [1/s]” only has an effect when a measurement system feed speed is specified for the 3D-View (refer to Chapter 3.14).

**Note:** Profile sequences are stored as "avi" files. You can only play back "avi" files recorded with the following programs:
- scanCONTROL 3D-View
- scanCONTROL Configuration Tools
- scanCONTROL Demo-Software
- scanCONTROL Setup-Software 2X10
- DeveloperDemo from Version 2.0.

**Note:** The "File" box is only available in offline mode!

**Note:** The elements of the "3D mode" box vary depending on the operation mode (Online/Offline mode).

**Note:** The default values for the parameters are listed in Chapter 5.5.

## 3.6 Displaying scanCONTROL Parameters in Offline Mode

When playing back saved profile sequences, you have the possibility of displaying the scanCONTROL settings used while saving the profile sequence.

➡ Press the "Info" button in the "File" box (refer to Fig. 3.8). You then access the "Scanner settings" dialog box.

**Note:** The following software packages save the scanCONTROL parameters:
- scanCONTROL 3D-View
- scanCONTROL Configuration Tools
- scanCONTROL Demo-Software (from Version 1.2)
- scanCONTROL Setup-Software 2X10
- DeveloperDemo (from Version 2.0, option must be activated)

In the dialog box you can choose between the following tabs:

**Scanner:** The "Exposure time" and "Number of profiles [1/s]" settings used while saving the profile sequence are displayed. You will find a precise description of the individual parameters in Chapter 3.4.1. Additionally the following information is displayed:

- **Name:** Name of the profile sequence
- **Path:** The path of the file
- **Type:** The type of the measurement system used for recording the profile sequence
- **SN:** The serial number of the measurement system used for recording the profile sequence
- **File format:** This indicates which information is contained in the saved profile sequence.
  - **x/z only:** The X and Z coordinates of the individual measurement points have been saved.
  - **x/z + data:** A complete reflection has been saved in the profile sequence. A reflection contains the following information for each measurement point: X/Z coordinates, width, intensity, threshold, moment of 0th and 1st order.
  - **x/z + [texture]:** The X and Z coordinates of the individual measurement points, their colored textures (e.g. "intensity") and the parameters used while saving the profile sequence have been saved.
  - **full set:** All four reflections, the time stamp and, where applicable, the measurement system parameters used while saving the profile sequence have been saved.
- **Changed:** The modification date of the profile sequence

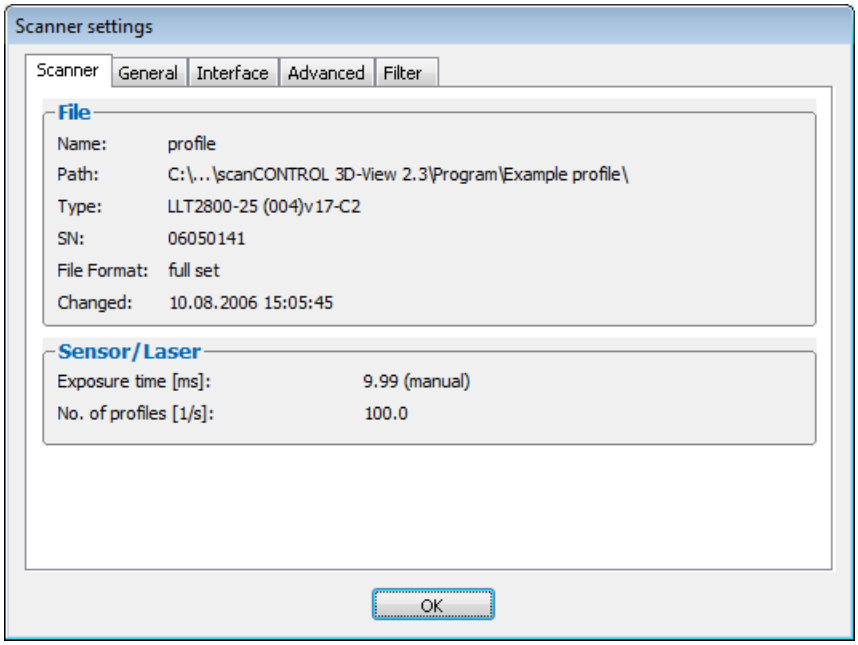


*Fig. 3.9: Scanner settings in offline mode*

**General:** The general settings of scanCONTROL are displayed. You will find a precise description of the individual parameters in Chapter 3.4.2.

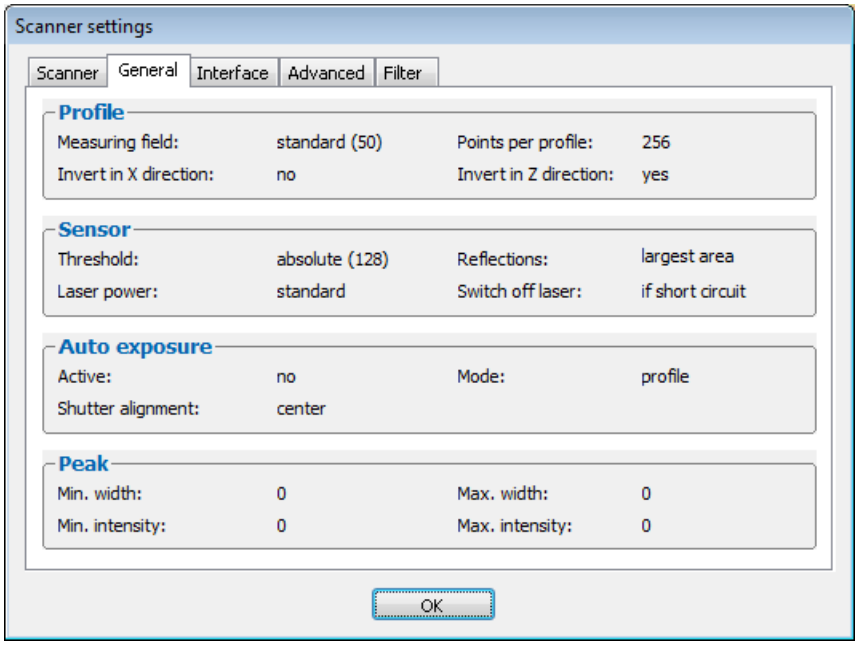


*Fig. 3.10: General scanner settings in offline mode*

**Interface:** The interface settings of scanCONTROL are displayed. You will find a precise description of the individual parameters in Chapter 3.4.2.

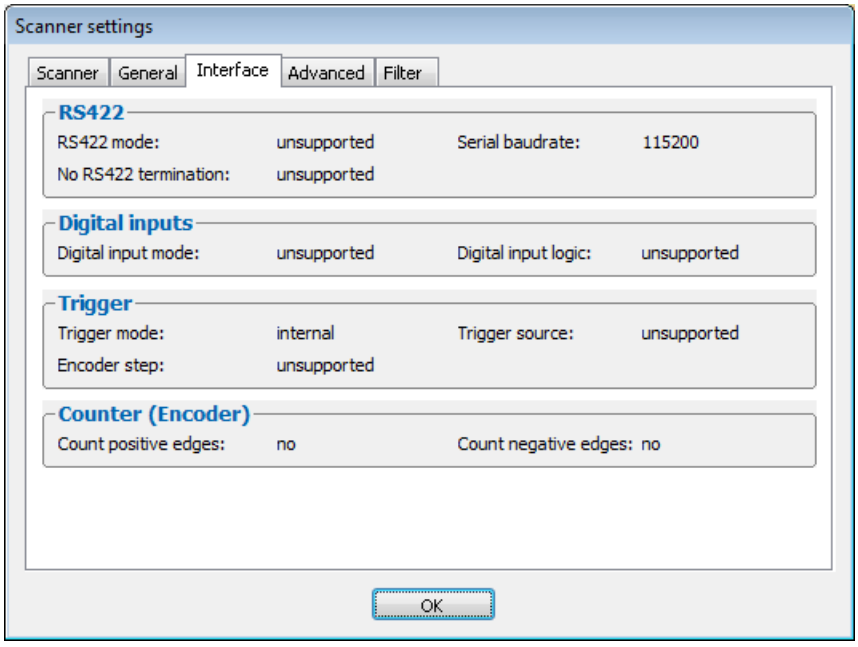


*Fig. 3.11: Interface settings of scanCONTROL in offline mode*

**Advanced:** The extended settings of scanCONTROL are displayed. You will find a precise description of the individual parameters in Chapter 3.4.2.

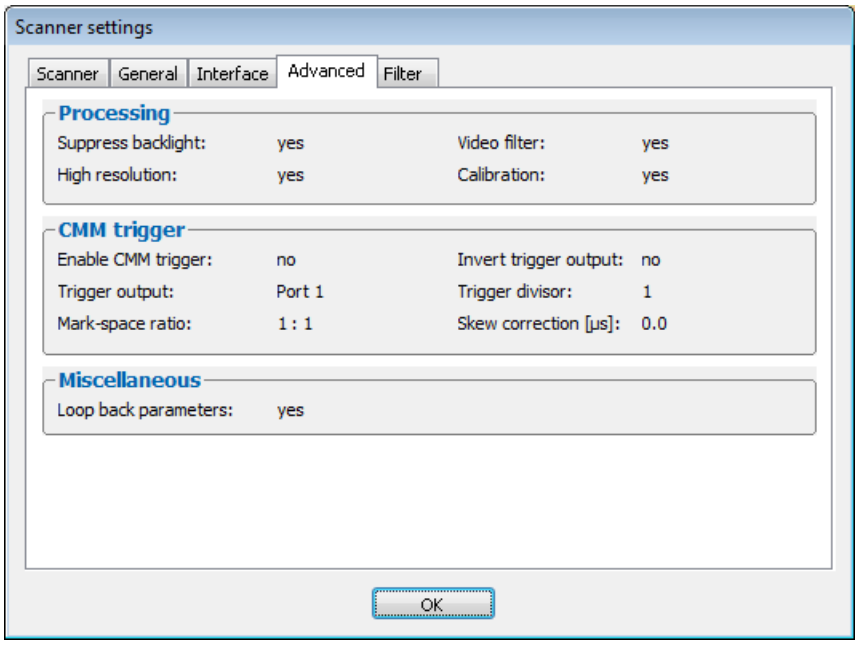


*Fig. 3.12: Extended scanner settings in offline mode*

**Filter:** The filter settings of scanCONTROL are displayed. You will find a precise description of the individual parameters in Chapter 3.13.

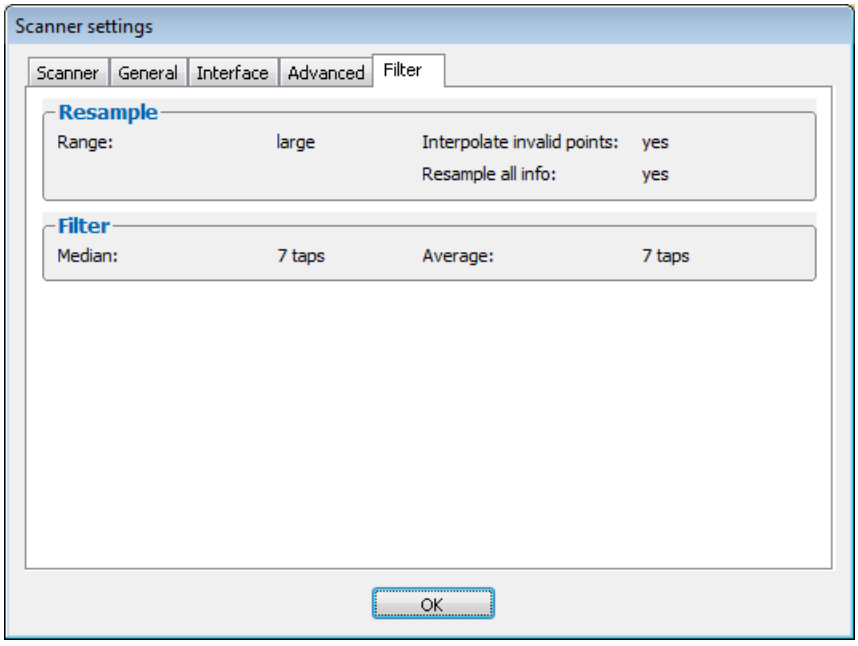


*Fig. 3.13: Filter settings in offline mode*

## 3.7 Description of the "Display settings" Box

The parameters in this box have an effect on the representation in the 2D- and 3D-Views.

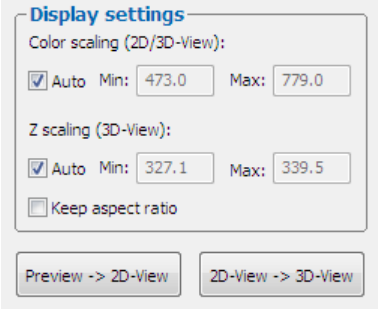


*Fig. 3.14: "Display settings" box*

You can enter the following settings:

- **Color scaling (2D/3D-View):** With these parameters you configure the color scaling in the 2D- and 3D-Views.
  - **Auto:** The scaling adapts to the smallest and largest color value of the point cloud automatically.
  - **Min/Max:** Use this parameter for manual color scaling. The unit of the entry fields depends on the selected color scaling:
    - **Intensity** (0 - 1023): Gray scale values
    - **Z coordinate** (45 - 615): mm
    - **Width** (0 - 1024): internal units
    - **Threshold** (0 - 1023): Gray scale values
    - **Moment 0** (0 - 218): internal units
    - **Moment 1** (0 - 226): internal units
- **Z scaling (3D-View):** With these parameters you configure the scaling of the Z axis in the 3D-View. Your entries in the fields "Min:" and "Max:" are specifications in mm.
  - **Auto:** The scaling adapts automatically to the smallest and largest Z value of the point cloud.
  - **Min/Max:** You use these parameters for manual scaling of the Z axis.
- **Keep aspect ratio:** With this parameter you determine the type of scaling for the 3D-View.
  - **Active:** The display is scaled so that the real aspect ratio of the displayed object is retained. If the feed speed of the sensor is known (refer to Chapter 3.14), the aspect ratio is retained for all three axes. If the feed speed is not known, only the aspect ratio for the X and Z coordinates is retained.
  - **Inactive:** The scaling adapts itself separately for each axis to the smallest and largest value on the axis.
- **Preview -> 2D-View:** Use this button to transfer the point cloud shown in the preview window into the 2D-View.
- **2D-View -> 3D-View:** You use this button to transfer the region of the point cloud marked in the 2D-View into the 3D-View.

**Note:** The default values for the parameters are listed in Chapter 5.5.

**Note:** The "Display settings" box is available in both online mode and offline mode!

## 3.8 Description of the Preview Window

The preview window visualizes the last transferred profile sequence of the measurement system. scanCONTROL continuously buffers profiles according to the number specified in the "Buffered profiles" entry field and transfers these as a profile sequence to the PC. The preview window is updated after receiving the profile sequence. The vertical axis corresponds to the index of the single points in X direction. The horizontal axis represents the single profiles (chronological sequence). The gray scale value texture of the display depends on the value selected in the "Color coding" entry field.

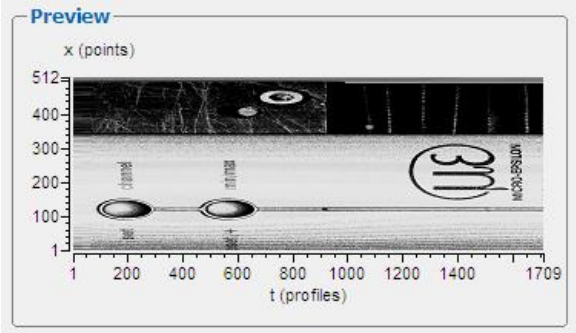


*Fig. 3.15: Preview window*

Depending on the setting of the entry field "Preview mode", the preview window shows the following behavior:

- **continuous**: The measurement system continuously receives data and respectively transfers the buffered profile sequence. The preview window is updated continuously.
- **trigger**: The measurement system is in the "Ready" status and doesn't transfer any data yet. You start the measurement recording with the "Trigger" button. The measurement system then acquires the specified number of profiles, transfers them to the PC and changes back to the "Ready" status. The preview window visualizes the received data.

To transfer the point cloud shown in the preview window into the 2D-View, you double click with the middle mouse button or with the mouse wheel on the preview window or you press the button "Preview → 2D-View" or you press <F9>.

## 3.9 Description of the 2D-View

The 2D-View visualizes the last profile sequence transferred from the preview window. The vertical axis corresponds to the index of the points in X direction. The horizontal axis represents the individual profiles (chronological sequence). The colored texture of the display depends on the value selected in the "Color coding" entry field. The 2D-View offers the following interaction options:

- **Marking a range**: Press the left mouse button and keep it pressed to draw out a range. The range is marked when you release the mouse button. Alternatively you can use the edit controls positioned to the left and beneath the 2D-View.
- **Zooming in the marked range**: Double click on the 2D-View with the left mouse button to zoom in the marked range. The 2D-View then completely visualizes the marked range. You can mark a range as often as required and zoom in the marked range. You use this function to display certain ranges with particular detail.
- **Zooming out the range**: To zoom out a previously zoomed range, you double click on the 2D-View with the right mouse button.
- **Transferring the marked range into the 3D-View**: Using the middle mouse button or the mouse wheel, double click on the 2D-View or press the button "2D-View → 3D-View" or press <F10> to transfer the marked range into the 3D-View and display it.

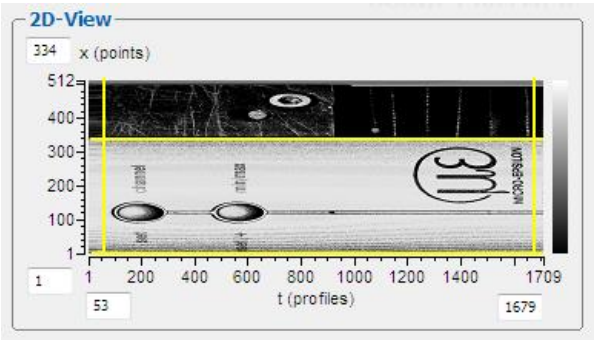


*Fig. 3.16: 2D-View*

## 3.10 Description of the 3D-View

The 3D-View visualizes the last profile sequence transferred from the 2D-View. The point cloud is displayed in an X/Y/Z or in an X/T/Z coordinate system, depending on the setting of the parameter "Enable feed speed" (refer to Chapter 3.14). The following units are used for the Y/T axis, depending on this setting:

| Feed Speed | Counter input | Unit |
|---|---|---|
| inactive | inactive | The profile indices are used for the T axis. |
| inactive | active | The respective counter reading is used for the T axis. |
| active | inactive | For the Y axis coordinates in mm are used, whereby the coordinates are calculated from scan rate, feed speed and profile index. |
| active | active | For the Y axis coordinates in mm are used, whereby the coordinates are calculated from feed speed and counter reading. |

The colored texture of the display depends on the value selected in the "Color coding" entry field. On the left side the current color scaling for the 3D-View is displayed. In the lower section the currently visible range is displayed for each axis. The 3D display offers the following interaction options:

- **Rotating the point cloud**: Press the left mouse button and keep the button pressed. Move the mouse to the left or right to rotate the point cloud horizontally. Move the mouse up or down to rotate the point cloud vertically.
- **Zooming in/out the point cloud**: Press the <Ctrl> key and the left mouse button and keep both key and button pressed. Move the mouse upwards to zoom in the point cloud. Move the mouse downwards to zoom out the point cloud.
- **Moving the range**: Press the <Shift> key and the left mouse button and keep both key and button pressed. Move the mouse in the direction in which you would like to move the point cloud.

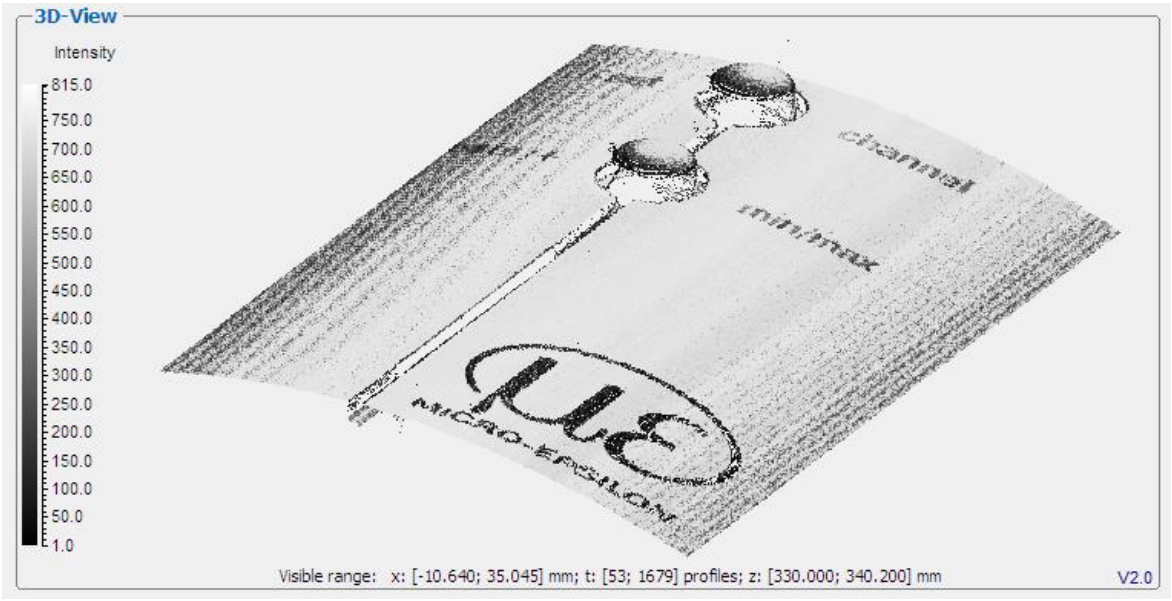


*Fig. 3.17: 3D-View*

## 3.11 Description of the Status Display

The status display is located below the "3D mode" box. The following information is displayed:

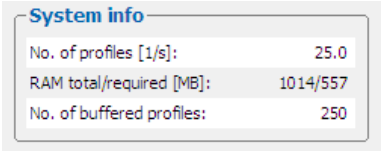


*Fig. 3.18: Status display*

- **No. of profiles [1/s]**: This display shows the effective scan rate scanCONTROL 3D-View evaluates the scanner data. The scan rate may deviate from the parameter "No. of profiles [1/s]" set in "Scanner settings", if the computer does not have sufficient processing power. The value is updated each time a complete profile sequence is received.
- **RAM total/required [MB]**: Two values are displayed. The first value indicates the size of the physical RAM of your system. The second value indicates the size of the memory currently used. If the value of the memory used exceeds that of the available memory, the system may accept user inputs only very slowly and error-free behavior is no longer guaranteed. The resolution of the 3D-View is automatically set to "normal" in this case (refer to Chapter 3.14) and the indicated "RAM total/required" is shown in red.
- **No. of buffered profiles**: The number of profiles which are currently located in the measurement system buffer.

**Note:** The size of the memory used should always be smaller than the size of the available memory. Otherwise the software may accept user inputs only very slowly and error-free behavior is no longer guaranteed.

## 3.12 3D Visualization of a Point Cloud – Step by Step

### 3.12.1 In Online Mode

- Carry out the required scanner settings for the measurement system.
- In the entry field "Preview mode" select the option "continuous" to continuously update the preview window or select the option "trigger" and press the button "Trigger" to display a profile sequence in the preview window (refer to Fig. 3.19).

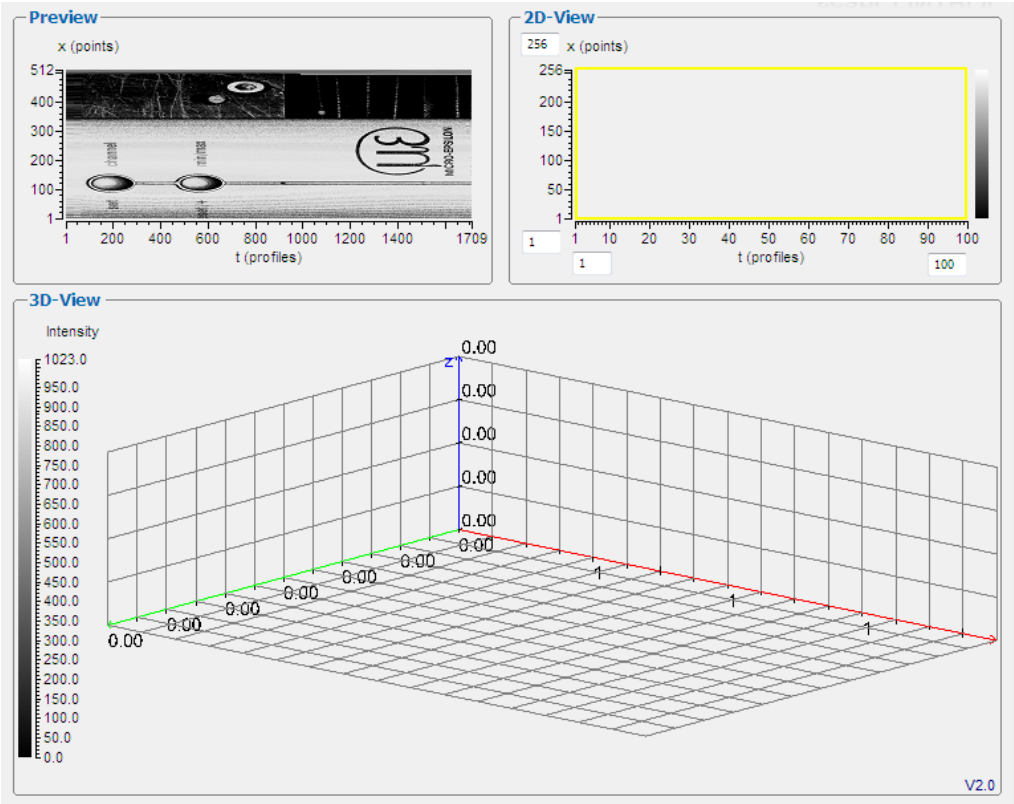


*Fig. 3.19: 3D visualization – step 1*

- Once the required profile sequence is displayed in the preview window, press the button "Preview → 2D-View" or double click with the middle mouse button or the mouse wheel in the preview window or press <F9> to transfer the point cloud into the 2D-View.
- In the 2D-View mark a range of interest and zoom in on the range with a double click with the left mouse button in the 2D-View, if necessary (refer to Fig. 3.20).

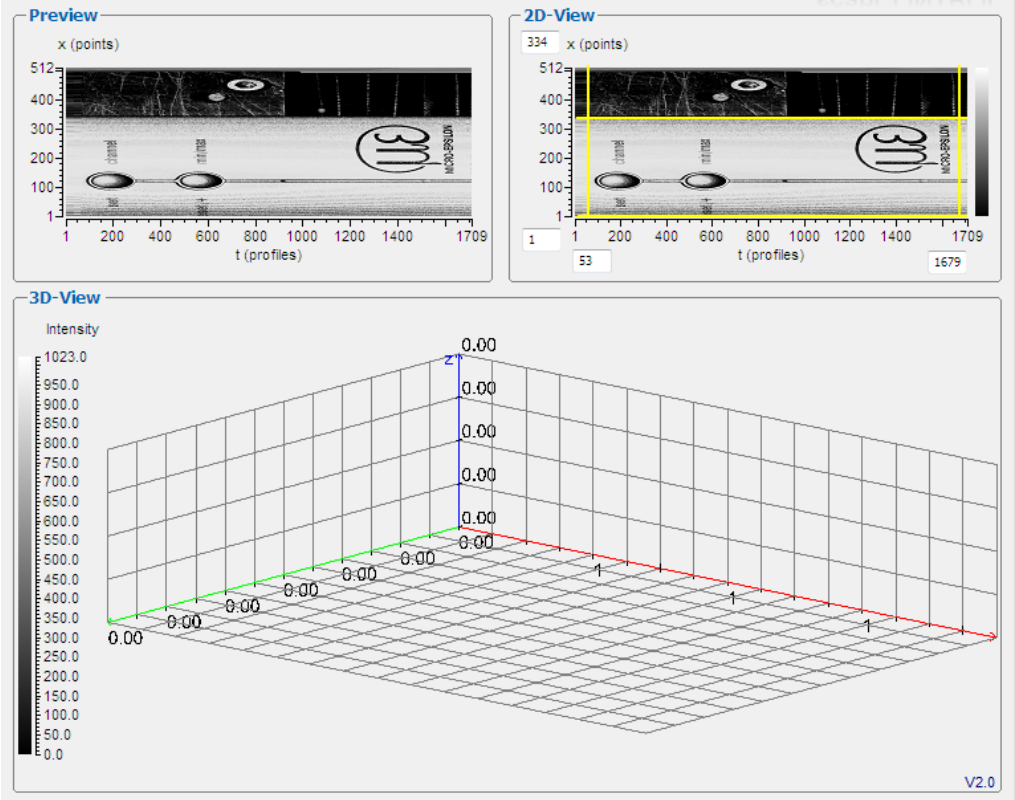


*Fig. 3.20: 3D visualization – step 2*

- Press the button "2D-View -> 3D-View" or double click with the middle mouse button or the mouse wheel in the 2D-View or press <F10> to transfer the point cloud from the 2D-View to the 3D-View. The message "Rendering 3D-View" appears in the status line. The procedure may take some seconds depending on the size of the point cloud and the system performance.

The point cloud is now displayed in the 3D-View (refer to Fig. 3.21).

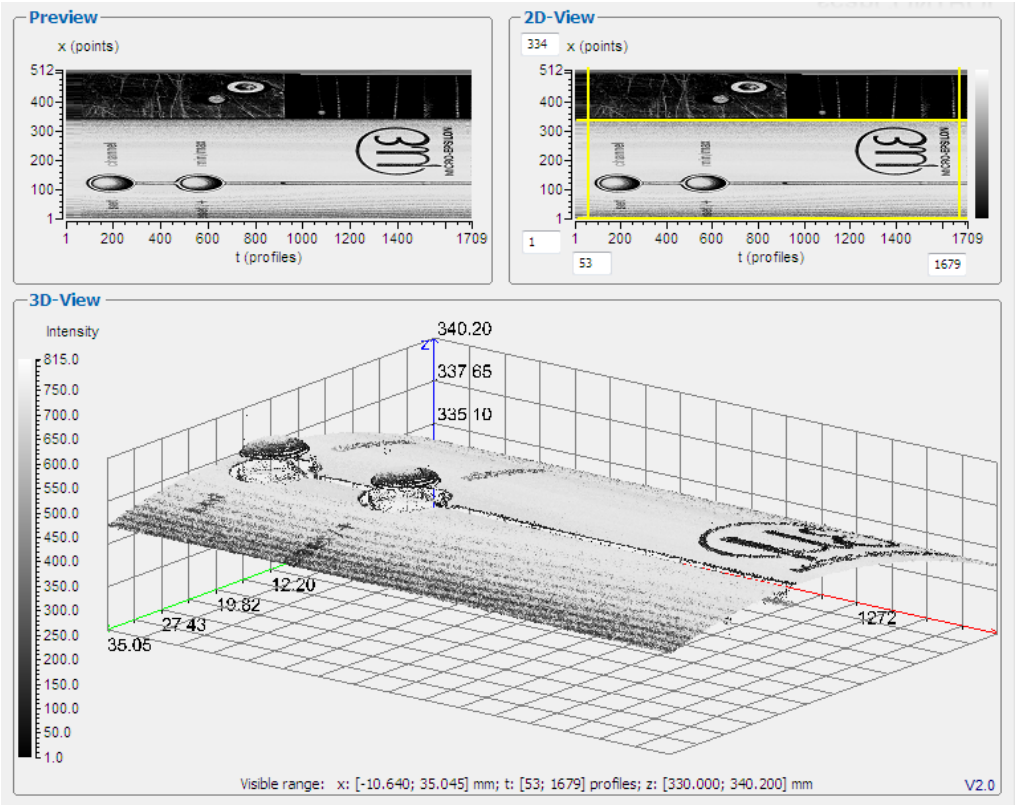


*Fig. 3.21: 3D visualization – step 3*

### 3.12.2 In Offline Mode

- Choose a previously saved profile file. For this purpose, either select the “File → Load profiles” menu item or press the corresponding button (see Fig. 3.7) in the toolbar.
- The profiles are now read from the file and the preview window is updated continuously (refer to Fig. 3.19). Press the button "Stop" to stop the playback, if necessary.

The profile sequence is automatically transferred to the 2D-View after termination of the loading process.

- In the 2D-View mark a range of interest and zoom in the range with a double click with the left mouse button in the 2D-View, if necessary (refer to Fig. 3.20).
- Press the button "2D-View -> 3D-View" or double click with the middle mouse button or with the mouse wheel in the 2D-View or press <F10> to transfer the point cloud from the 2D-View to the 3D-View. The message "Rendering 3D-View" appears in the status line. The procedure may take some seconds depending on the size of the point cloud and the system performance.

The point cloud is now displayed in the 3D-View (refer to Fig. 3.21).

## 3.13 Filtering Measurement Data

In combination with the scanCONTROL measurement system, scanCONTROL 3D-View offers you the possibility of equidistantly resampling the profile data in the X direction and of filtering it before the transfer. Invalid points are linearly interpolated during the resampling using valid points. If you want to use the filter functions, it is recommended to activate the equidistantly resampling.

You access the "Filter settings" dialog box via the "Filter…" button in the “Scanner settings” box (refer to Fig. 3.3).

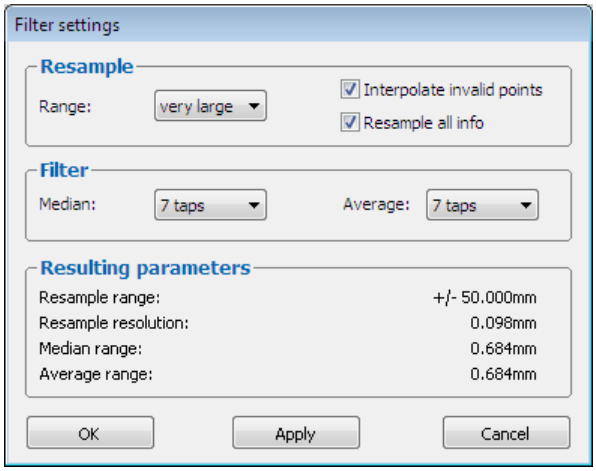


*Fig. 3.22: "Filter settings" dialog box*

The following input options are available:

- **Range:** The range which is equidistantly resampled.

| Setting | Resampled range | | | |
|---|---|---|---|---|
| | **28x0-10** | **26x0-25/27x0-25/ 28x0-25/29x0-25** | **26x0-50/27x0-50/ 29x0-50** | **26x0-100/27x0-100/ 28x0-100/29x0-100** |
| none | deactivated | deactivated | deactivated | deactivated |
| tiny | ±0.4 mm | ±0.8 mm | ±1.6 mm | ±4.0 mm |
| very small | ±0.5 mm | ±1.0 mm | ±2.0 mm | ±5.0 mm |
| small | ±1.0 mm | ±2.0 mm | ±4.0 mm | ±10.0 mm |
| medium | ±2.0 mm | ±4.0 mm | ±8.0 mm | ±20.0 mm |
| large | ±4.0 mm | ±8.0 mm | ±16.0 mm | ±40.0 mm |
| very large | ±5.0 mm | ±10.0 mm | ±20.0 mm | ±50.0 mm |
| huge | ±10.0 mm | ±20.0 mm | ±40.0 mm | ±100.0 mm |

- **Interpolate invalid points:** If equidistantly resampling is active, this specifies whether invalid points will be replaced by neighbouring valid points using linear interpolation. Gaps will be closed if this parameter is active. In order to leave gaps open you must not activate this parameter.
- **Resample all info:** If equidistantly resampling is active, this parameter specifies which data will be recalculated according to the equidistantly resampling. Deactivate this parameter to recalculate the X and Z coordinates only. Activate this parameter to recalculate all data (X / Z coordinates, width, intensity, threshold, moment 0th and 1st order).
- **Median:** Activate a median filter with this parameter. Each point is respectively calculated from the median of the adjacent points.
  - **none:** The median filter is not applied.
  - **3 taps:** You use a median filter with a filter size of three.
  - **5 taps:** You use a median filter with a filter size of five.
  - **7 taps:** You use a median filter with a filter size of seven.

- **Average:** Activate an average filter with this parameter. Each point is respectively calculated from the average of the adjacent points.
  - **none:** The average filter is not applied.
  - **3 taps:** You use an average filter with a filter size of three.
  - **5 taps:** You use an average filter with a filter size of five.
  - **7 taps:** You use an average filter with a filter size of seven.

Confirm your settings with the button "OK".

**Note:** After changing the filter settings you must transfer the profile sequence from the preview window to the 2D-View and then to the 3D-View in order to assume the changes in the 3D view.

**Note:** When using a file as data source (see Chapter 3.5), the filter functions are only available if the filter and resampling functions have been disabled during saving the profile sequence.

**Note:** The default values for the parameters are listed in Chapter 5.5.

## 3.14 Properties of the 3D-View

The "3D-View" dialog box offers you the possibility of configuring the settings for the 2D- and 3D-Views.

Either select the "Settings → 3D-View..." menu item or press the corresponding button (see Fig. 3.23) in the toolbar in order to access the "3D-View" dialog box.

*Fig. 3.23: "3D settings" button*

The following input options are available:

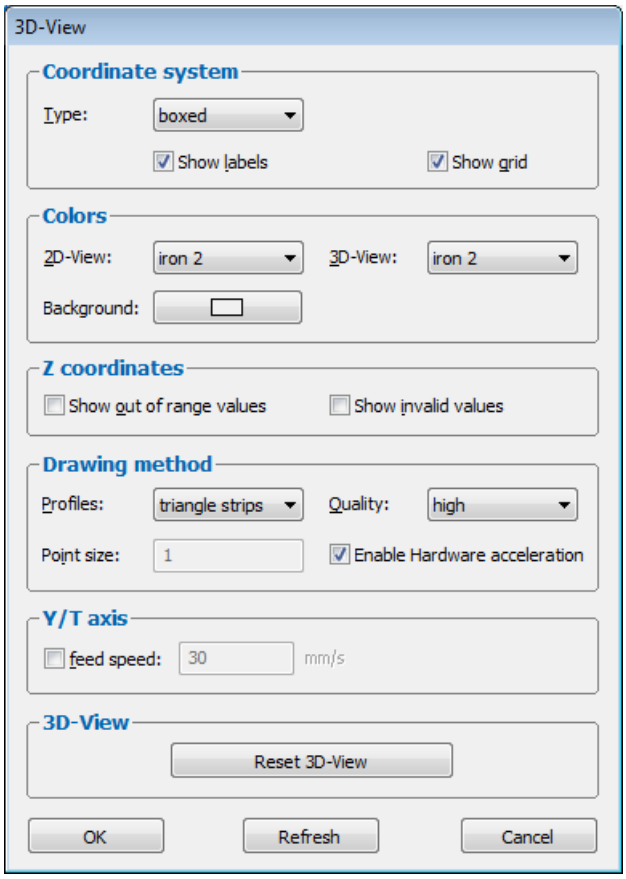


*Fig. 3.24: Properties of the 3D-View*

- **Type:** Select the type of the coordinate system displayed in the 3D-View.
  - **none:** No coordinate system is displayed.
  - **centered:** The coordinate system is displayed centered.
  - **boxed:** The coordinate system is displayed around the displayed data.
- **Show labels:** Chooses whether the axis legend is to be displayed.
- **Show grid:** Select whether the grid lines are to be displayed (only with type "boxed").
- **2D-View:** Selects a predefined color palette for the texture in the 2D-View (refer also to Fig. 5.26).
  - **colors**
  - **grayscale** (grayscale value display)
  - **HSV**
  - **alt. colors**
  - **iron 1**
  - **iron 2**

- **3D-View:** Select a predefined color palette for the texture in the 3D-View (refer also to Fig. 5.26).
  - **colors**
  - **grayscale** (grayscale value display)
  - **HSV**
  - **alt. colors**
  - **iron 1**
  - **iron 2**
- **Background:** Select the background color of the 3D-View.
- **Show out of range values:** You activate this parameter to display values with a z coordinate outside the selected z range.
- **Show invalid values:** This parameter is used to display invalid values in the 3D-View. In this context an invalid value is designated as a point for which the scanCONTROL measurement system could not detect any reflection.
- **Profiles:** With this parameter you select the display method for the 3D-View.
  - **points:** Individual points in the point cloud are displayed.
  - **lines:** The individual profiles are shown as lines.
  - **triangle strips:** Surface parts are shown which are formed by triangles. The corner points of the triangles are calculated using the points in the point cloud. To do this, gaps arising due to invalid points are filled as far as possible.
  - **triangles:** Surface parts are shown which are formed by triangles. The corner points of the triangles are calculated using the points in the point cloud which are located directly adjacent to one another.

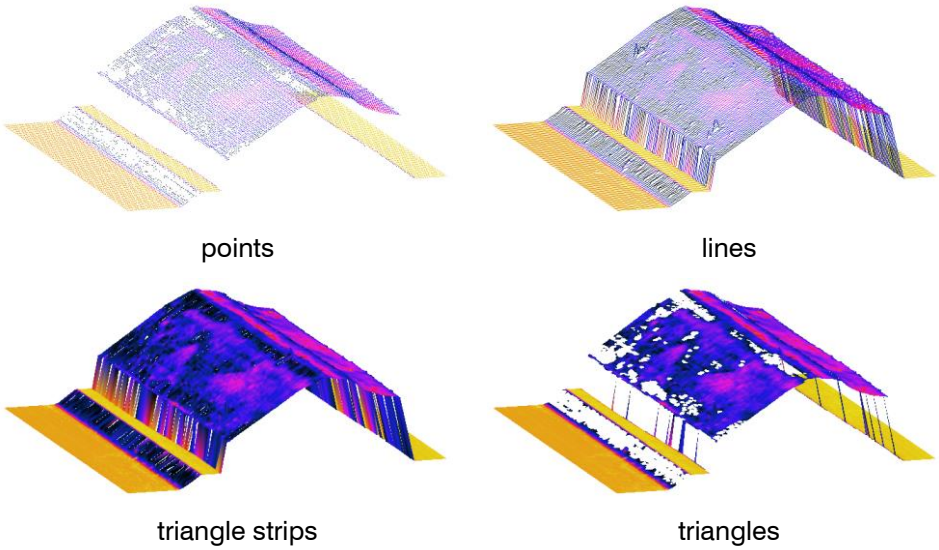


*Fig. 3.25: Display methods for the 3D-View*

- **Quality:** With this parameter you determine the resolution of the 3D-View.
  - **low:** A maximum of 64 x 64 points are displayed in the 3D-View. If the number of points in the X and/or Y/T direction is larger, the number of points is reduced by average value computation.
  - **normal:** A maximum of 256 x 256 points are displayed in the 3D-View. If the number of points in the X and/or Y/T direction is larger, the number of points is reduced by average value computation.
  - **high:** All points are displayed in the 3D-View. Where many points are involved, this display method needs a high level of system resources.

**Note:** If the amount of used memory exceeds that of the available memory (refer to Chapter 3.11), the software may accept user inputs only very slowly and error-free behavior is no longer guaranteed. In this case the resolution of the 3D-View is set to "normal" automatically.

- **Point size:** With this parameter you specify the size of the points which are displayed in the 3D-View. This parameter is only active in case of using the "points" option for the "Profiles" parameter.
- **Enable Hardware acceleration:** Enable or disable the hardware acceleration of your graphics adapter.

- **feed speed:** With this parameter you specify the feed speed. Depending on the operation mode of scanCONTROL, this parameter has the following unit:
  - **Trigger input inactive, counter input inactive:** mm/s
  - **Trigger input active, counter input inactive:** mm/trigger pulse
  - **Counter input active:** mm/counter pulse

  With a known feed speed scanCONTROL 3D-View calculates real coordinates in the feed direction and displays them as the Y axis in the 3D-View. If the feed speed is not known, the profile indices are plotted in the feed direction and they are displayed as the T axis in the 3D-View.
- **Reset 3D-View:** With this button you can reset the orientation and the offset of the displayed point cloud changeable through mouse functions (refer to Chapter 3.10).
- **Refresh:** Use this button to apply the settings you have made to the 2D- and 3D- Views.

Confirm your settings with OK.

**Note:** The default values for the parameters are listed in Chapter 5.5.

## 3.15 Resetting Parameters to the Default Settings

With this function you reset all parameters of scanCONTROL 3D-View to their default settings. You will find a list of the parameters in Chapter 5.5.

➪ Either select the "Settings → Reset..." menu item or press the corresponding button (see Fig. 3.26) in the toolbar in order to access the "Reset parameters" dialog box (see Fig. 3.27).

*Fig. 3.26: "Reset" button*

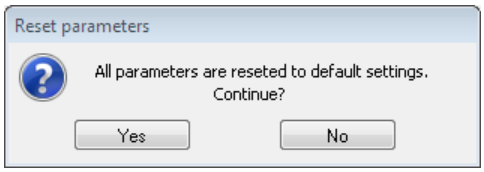


*Fig. 3.27: "Reset parameters" dialog box*

Confirm the dialog box to reset the parameters to the default settings.

## 3.16 Functions of the Toolbar

A summary of the functions of the toolbar (see Fig. 3.28) can be seen in the following.

*Fig. 3.28: Toolbar*

Selects the scanCONTROL measurement system connected to the PC as data source (refer to Chapter 3.4).

Selects a file in which profiles have been saved previously as data source (refer to Chapter 3.5).

Saves the profile sequence from the 2D-View to a file (refer to Chapter 4.3).

Loads parameters from a file (refer to Chapter 4.2.2).

Saves the current parameters to a file (refer to Chapter 4.2.1).

Resets parameters to default settings (refer to Chapter 3.15).

Shows the dialog for configuring the settings for the 3D-View (refer to Chapter 3.14).

Activates the full screen mode (refer to Chapter 4.1).

Exits the full screen mode (refer to Chapter 4.1).

## 3.17 Adjusting scanCONTROL Network Settings (Ethernet Configurator)

When using a scanCONTROL measurement system with an Ethernet interface you may adjust the system network settings (IP address, etc.) by selecting the "Options → Ethernet Configurator" menu item. The "Ethernet Configurator" dialog will be opened.

**Note:** To be able to operate a scanCONTROL measurement system via Ethernet with 3D-View, the measurement system and your PC must be located in the same subnet. Adjust any relevant network settings for the measurement system in the "Ethernet Configurator" dialog.

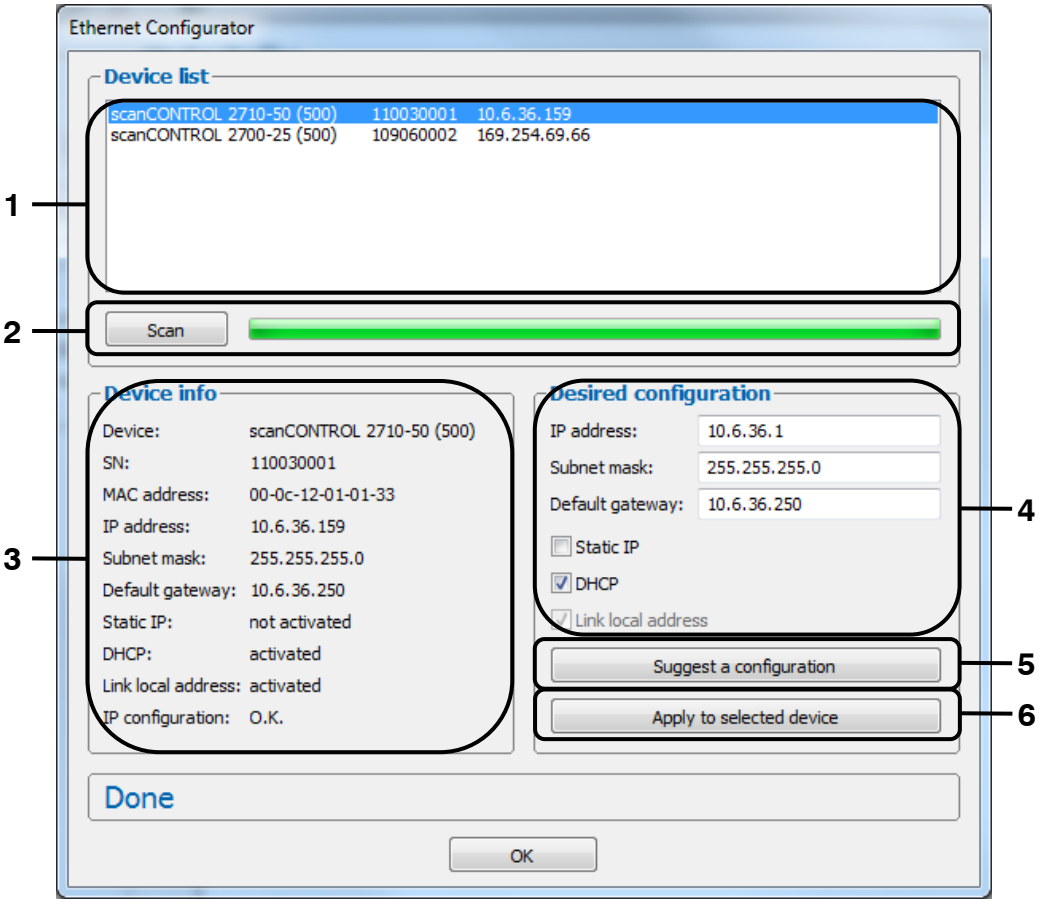


*Fig. 3.29: "Ethernet Configurator" dialog*

**Display elements and parameters in the "Ethernet Configurator" dialog:**

1 **Device list:** This section lists all available measurement systems. Click "Scan" to refresh the list. Select the desired measurement system.

2 **Scan:** Click this button to search for scanCONTROL measurement systems in all subnets connected to the PC. The scan progress is displayed. When the scanning is complete, any found measurement systems are displayed in the list.

3 **Device info:** Displays the current settings for the selected scanCONTROL measurement system:
- **Device:** Device name
- **SN:** Serial number
- **MAC address:** Physical address
- **IP address:** IP address
- **Subnet mask:** Subnet mask
- **Default gateway:** Default gateway
- **Static IP:** "Static IP" address option enabled
- **DHCP:** "DHCP" option enabled
- **Link local address:** "Link local address" option enabled
- **IP configuration:** Indicates whether the network configuration is valid. If the network configuration is not valid, the measurement system cannot be used with 3D-View.

4 **Desired configuration:** Use the following input fields to enter the network configuration for the selected scanCONTROL measurement system:
- **IP address:** IP address
- **Subnet mask:** Subnet mask
- **Default gateway:** Default gateway
- **Static IP:** "Static IP" option – if this option is enabled, dynamic address allocation is disabled. The IP address entered is used as IP address. This parameter takes precedence over the "DHCP" and "Link local address" options.
- **DHCP:** "DHCP" option – if this option is enabled, the IP address is allocated dynamically through a DHCP server. This parameter takes precedence over "Link local address".
- **Link local address:** "Link local address" option – if this option is enabled, the IP address is allocated dynamically in the local subnet 169.254.x.x. This option is always enabled.

5 **Suggest a configuration:** Click this button to have a suitable configuration for the selected scanCONTROL measurement system determined automatically. After the process is complete, the system automatically completes the input fields in the "Desired configuration" section.

6 **Apply to selected device:** Click this button to apply the network configuration specified in the "Desired configuration" section to the selected scanCONTROL measurement system.

Proceed as follows to manually enter the network configuration parameters for a scanCONTROL measurement system:

- When the "Ethernet Configurator" dialog is opened, the system automatically searches for available measurement systems. If the measurement system is not connected to your subnet yet, establish a connection, and click the "Scan" button. When scanning is complete, the measurement system is displayed in the device list.
- Select the required measurement system from the device list.
- Specify the required network settings in the input fields in the "Desired configuration" section.
- Click "Apply to selected device" to apply the settings to the selected measurement system.
- Click OK to confirm the selections in the "Ethernet Configurator" dialog.

Proceed as follows to automatically specify network configuration parameters for a scanCONTROL measurement system:

- When the "Ethernet Configurator" dialog is opened, the system automatically searches for available measurement systems. If the measurement system is not connected to your subnet yet, establish a connection, and click the "Scan" button. When scanning is complete, the measurement system is displayed in the device list.
- Select the required measurement system from the device list.
- Click the "Suggest a configuration" button to have a suitable network configuration for the selected scanCONTROL measurement system determined automatically. After the process is complete, the system automatically completes the input fields in the "Desired configuration" section.
- Click "Apply to selected device" to apply the settings to the selected measurement system.
- Click OK to confirm the selections in the "Ethernet Configurator" dialog.

## 3.18 Documentation and Help for scanCONTROL 3D-View

You can call up various documentation and help items via the "?" menu.

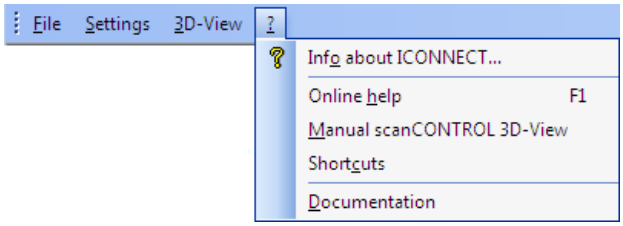


*Fig. 3.30: "?" menu*

When you select the "? → Online help" menu item or press the <F1> key, the documentation for the view currently shown will appear.

With using the "? → Shortcuts" menu item, you obtain an overview of the available key shortcuts and mouse functions.

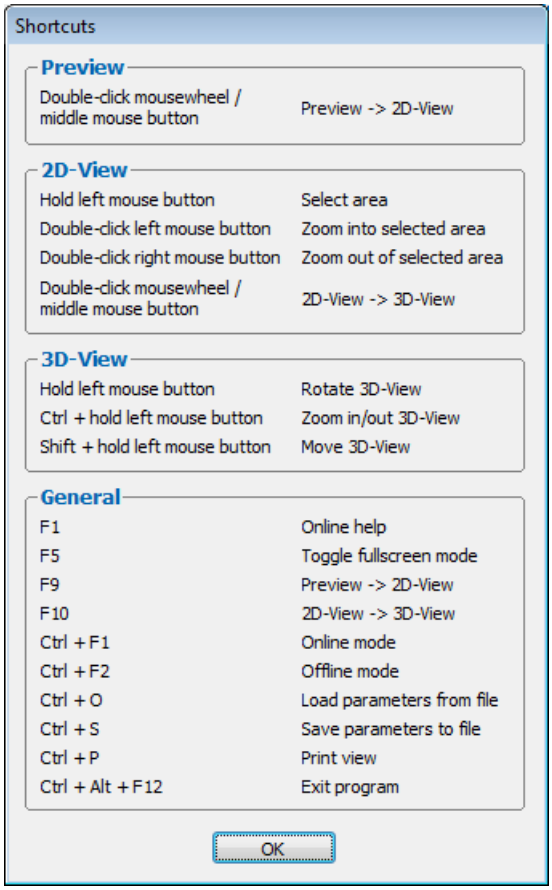


*Fig. 3.31: Overview of the key shortcuts and mouse functions*

## 3.19 Exiting scanCONTROL 3D-View

Select the "File → Exit" menu item or press the standard Windows button "x" in the title bar of the program window in order to exit scanCONTROL 3D-View.

# 4. Extended Functions of scanCONTROL 3D-View

## 4.1 Full Screen Mode

scanCONTROL 3D-View allows you to hide the entry fields on the left side, the preview window, the status display and the 2D-View in order to use the complete screen area for the 3D-View. The functions described in Chapter 3.10 are also available in full screen mode.

- Either select the "3D-View → Toggle fullscreen mode" menu item or press the corresponding button in the toolbar (see Fig. 4.1) in order to activate the full screen mode.
- In order to exit the full screen mode, either select the "3D-View → Toggle fullscreen mode" menu item or press the corresponding button in the toolbar (see Fig. 4.1) again.

*Fig. 4.1: "Activate/Deactivate full screen mode" button*

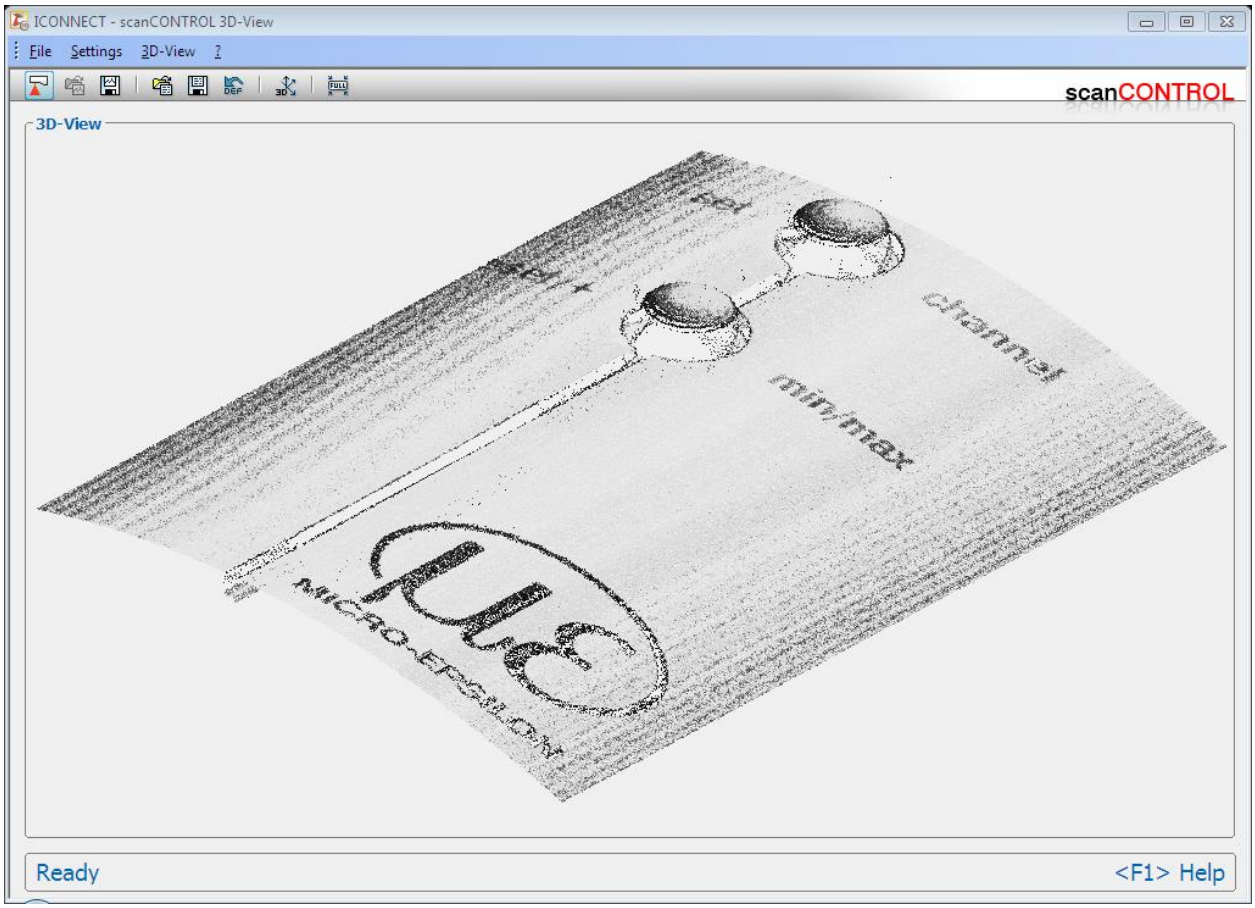


*Fig. 4.2: Full screen mode*

## 4.2 Loading and Saving Parameters

scanCONTROL 3D-View enables you to save and load parameter records. For example, you can save the parameters for various measurement objects or for different boundary conditions. You can simplify the setting up of a new object by a step-by-step adaptation.

Once you have saved the parameters for a measurement setup, you can reload them at any later point in time. You can save the parameters of any number of measurement objects.

In Chapter 5.5 you will find a complete list of all parameters which are loaded or saved.

### 4.2.1 Saving Parameters

➡ In order to save the current parameters, either select the "Settings → Save parameters to file..." menu item or press the corresponding button in the toolbar (refer to Fig. 4.3).

*Fig. 4.3: "Save parameters to file" button*

A standard Windows dialog is displayed where you select the path and file name for saving the parameters. As standard, the file name has the extension ".s3d". You can use a different file extension by selecting the "All files (*.*)" option in the Windows dialog in the "File type" selection field. The parameters are saved in the selected file after confirmation of the dialog.

### 4.2.2 Loading Parameters

➡ In order to load previously saved parameters, either select the "Settings → Load parameters from file..." menu item or press the corresponding button in the toolbar (refer to Fig. 4.4).

*Fig. 4.4: "Load parameters from file" button*

A standard Windows dialog is displayed where you select the path and file name from which the parameters should be loaded. As standard, the file name has the extension ".s3d". You can use a different file extension by selecting the "All files (*.*)" option in the Windows dialog in the "File type" selection field. The parameters are loaded after confirmation of the dialog.

## 4.3 Saving Profile Sequences

scanCONTROL 3D-View enables you to save the data transferred from scanCONTROL as a profile sequence. This file can later be loaded for offline analysis (refer to Chapter 3.5).

**Note:** The data buffered in the 2D-View are used for saving the profile sequence. The selection in the 2D-View is irrelevant in this case.

➡ Either select the "File → Save profiles" menu item (refer to Fig. 4.5) or press the corresponding button in the toolbar (refer to Fig. 4.6) in order to save the profile sequence.

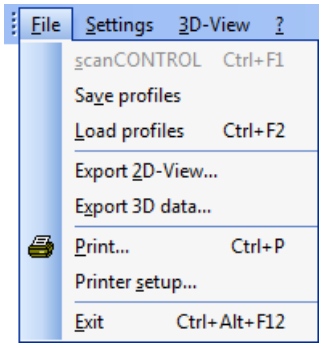


*Fig. 4.5: Menu "File"*

*Fig. 4.6: "Save profiles" button*

A standard Windows dialog is displayed where you select the path and file name for saving the profile sequence. The profiles buffered in the 2D-View are saved in the selected file after confirmation of the dialog. This process is displayed in a status dialog (refer to Fig. 4.7).

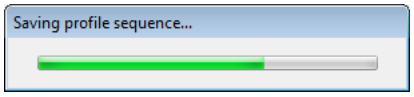


*Fig. 4.7: "Saving profile sequence" status dialog*

## 4.4 Exporting Images

scanCONTROL 3D-View allows exporting data transferred from scanCONTROL as an image. You can import the data into image processing software later for further processing. Depending on the selected color scale (Color coding, see Chapter 3.4.1), different image formats are stored:

| Color scale | Image type | Image depth [bit] | Information per pixel [bit] |
|---|---|---|---|
| Intensity | png | 16 | 10 (upper) |
| Z coordinate | png | 16 | 16 |
| Width | png | 16 | 10 (upper) |
| Threshold | png | 16 | 10 (upper) |
| Moment 0 | tiff | 32 | 32 |
| Moment 1 | tiff | 32 | 32 |

Proceed as follows in order to export the data transferred from scanCONTROL as an image:

- Transfer the desired data to the 2D display (see Chapter 3.8)
- Select the “File → Export 2D-View...” menu item (see Fig. 4.5) in order to export the data.

A standard Windows dialog is displayed where you can select the path and file name.

- Select the path and file name and confirm the dialog with OK.

The data will now be exported.

## 4.5 Exporting 3D Data

scanCONTROL 3D-View allows exporting visualized 3D data. This gives you the possibility of importing data transferred from scanCONTROL into 3D processing software and reprocessing the data. There are three file formats available:

- **asc:** The coordinates and textures of the point cloud are saved in columns in an ASCII file.
- **stl:** The coordinates are saved as a surface description. Two formats are available:
  - **ascii**
  - **stl**
- **csv:** The data is exported using the csv format. Three matrices are written to the csv file:
  - X coordinates
  - Y/T coordinates
  - Z coordinates

**Note:** One of the uses of stl files in industry is to produce prototypes with stereo-lithographic machines. The stl files produced by scanCONTROL 3D-View are not suitable for the production of prototypes!

**Note:** The data marked in the 2D-View are used for exporting 3D data.

- First select the range to be exported in the 2D-View.
- Select the "File → Export 3D data..." menu item (see Fig. 4.5) to export the data.

A standard Windows dialog box appears in which you can select the path and name of the file.

- Select the required type in the entry field "File type" and confirm the dialog box with OK.

If you have selected the file type "stl", an additional dialog box appears in which you can choose between "ascii" or "binary".

- Choose the required format and confirm the dialog box with "OK".

The data are then exported. You can watch the progress of the export task in the displayed progress dialog box.

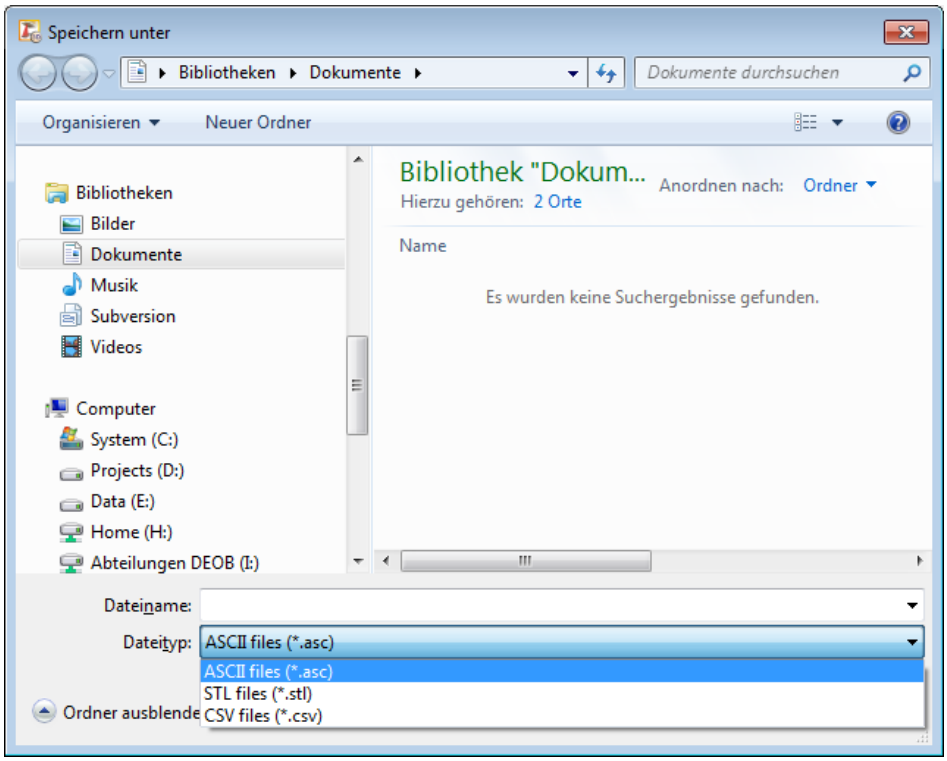


*Fig. 4.8: Selecting the data type when exporting 3D data*

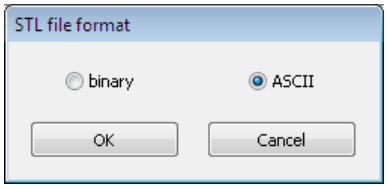


*Fig. 4.9: Format selection for STL files*

## 4.6 Printing

scanCONTROL 3D-View enables you to print out the main view (preview window, status display, 2D- and 3D-Views) as well as the full screen.

### 4.6.1 Adjusting the Printer Settings

➡ Select the "File → Printer setup..." menu item (refer to Fig. 4.5) to configure your printer.

A standard Windows dialog box opens in which you make the required settings.

### 4.6.2 Printing the Current View

➡ You print the currently visible view via the "File → Print..." menu item (refer to Fig. 4.5) or with the <Ctrl + P> shortcut.

**Note:** Printing the current view is only available in case of an inactive hardware acceleration (see Chapter 3.14)

# 5. Annex

## 5.1 Notes on Using scanCONTROL 3D-View

Please note the following when operating scanCONTROL 3D-View.

**1** - Never disconnect the IEEE1394 connection between the scanCONTROL and the computer while the software is running.
- Never switch off the power supply of scanCONTROL while the software is running.
- Never press the reset/user mode button on the controller (scanCONTROL 2800/2810) while the software is running.
- Never activate the standby mode or shut down status of your computer when the measurement system is connected to the computer.

  This may cause the operating system to shut down unintentionally.

**2** Only use version 6.4.6 of the CMU driver which is delivered on the CD. If a different driver or a different version of the CMU driver for the scanCONTROL is installed at a later date then it will not be possible to operate the scanner with scanCONTROL 3D-View.

**3** There may be a discrepancy between the setpoint value and the actual value for the no. of scans per second if the number of scans is set too high or the processing power of the PC is insufficient.

**4** Use the parameter "Measuring field" in the "Scanner settings" to define the resolution in the directions of the X axis and the Z axis. The value of the X axis is also influenced by the input field "Number of points per profile", and takes priority over the "Measuring field" parameter. Choosing a measuring field of, for example, 512x256 pixels and a resolution of 1024 points per profile is not consistent. In this case a measuring field of 1024x256 is selected automatically.

**5** The "Exposure time" parameter in the "Scanner settings" input field specifies the exposure time for the scanner. The value is also influenced by the "No. of profiles" parameter. The actual value of "No. of profiles" has priority over the "Exposure time" parameter. This results from the inequality "1/(No. of profiles) >= (Exposure time)". This means, for example, with the setting "Exposure time [ms]: 10" and "No. of profiles [1/s]: 200" the "Exposure time" value is adjusted. The new value for the "Exposure time" parameter is 5 ms.

**6** The "? → Online help" menu item or <F1> key can be used for calling up help for the view currently displayed.

**7** When you cannot see any profile in the preview window and no error messages are displayed in the "Status line", proceed as follows:
Reset the parameters to the default settings via the "Settings → Reset..." menu item. Then valid parameters are loaded into the "Scanner settings".

**8** scanCONTROL 3D-View always starts in online mode.

## 5.2 Key Shortcuts/Mouse Functions

Use the key shortcuts and mouse functions to work faster! There are the following possibilities:

| Preview window | |
|---|---|
| **Mouse/key combination** | **Action** |
| Double click of mouse wheel/middle mouse button | Transfers the point cloud from the preview window to the 2D-View. |

| 2D-View | |
|---|---|
| **Mouse/key combination** | **Action** |
| Hold left mouse button pressed and move mouse | Marks a range. |
| Double click of left mouse button | Zooms in the marked range. |
| Double click of right mouse button | Zooms out the displayed range. |
| Double click of mouse wheel/middle mouse button | Transfers the marked point cloud from the 2D-View to the 3D-View. |

| 3D-View | |
|---|---|
| **Mouse/key combination** | **Action** |
| Hold left mouse button pressed and move mouse | Rotates the point cloud. |
| Hold Ctrl + left mouse button pressed and move mouse up/down | Zooms in/out the point cloud. |
| Hold Shift + left mouse button pressed and move mouse | Moves the point cloud. |

| General | |
|---|---|
| **Key shortcut** | **Action** |
| F1 | Opens the online help. |
| F5 | Toggles view (main view ↔ full screen). |
| F9 | Transfers the point cloud from the preview window to the 2D-View. |
| F10 | Transfers the marked point cloud from the 2D-View to the 3D-View. |
| Ctrl + F1 | Changes to online mode. |
| Ctrl + F2 | Changes to offline mode. |
| Ctrl + O | Loads parameters from a file. |
| Ctrl + S | Saves the current parameters to a file. |
| Ctrl + P | Prints the current view. |
| Ctrl + Alt + F12 | Closes scanCONTROL 3D-View |

## 5.3 Status and Error Messages

Various status and error messages are displayed in the status line of the individual views. The following messages are possible:

| Message | Description | Action |
|---|---|---|
| Active: LLT[Type] ([Option])[Version] | There is no fault present. scanCONTROL transfers data to the PC continuously. | - |
| Active: scanCONTROL [Type]([Option])[Version] | | |
| Ready: LLT[Type] ([Option])[Version] | There is no fault present. scanCONTROL is prepared to transfer data. | Press the button "Trigger" to start the data transfer to the PC. |
| Ready: scanCONTROL [Type]([Option])[Version] | | |
| Wrong driver version CMU | An incorrect version of the CMU driver has been installed. | Reinstall the driver as described in Chapter 2.6, 2.7, 2.8 and 2.9. |
| Internal error | An unknown error has occurred. | Close 3D-View and reset the controller to the default settings by pressing the reset button on the controller (scanCONTROL 28X0) and by reconnecting the power supply (scanCONTROL 26X0/27X0/29X0) respectively. |
| scanCONTROL-parameters invalid | The parameters which have been transferred to scanCONTROL are incorrect. | |
| Error while data transfer | An error has occurred during the data transfer. | |
| No scanCONTROL found | scanCONTROL is not connected to the PC via IEEE1394 and Ethernet respectively or the power supply of scanCONTROL is switched off or the CMU driver is not installed | Check the IEEE1394/Ethernet connection and check whether the scanner is switched on and connected to a power supply. Check if the IEEE1394/Ethernet cable is broken. Also check whether the CMU-driver is installed (refer to Chap. 2.6, 2.7, 2.8, 2.9). |
| scanCONTROL S/N not found | scanCONTROL 3D-View was used last with a different model of scanCONTROL. | Open the "Advanced scanner settings" dialog box and press the button "Next" to select the current scanCONTROL. |
| No free scanCONTROL found | All scanners connected to the PC are already being used by other programs. | Close other programs accessing scanCONTROL. |
| scanCONTROL is already in use | The currently used scanner is already being used by another program. | Close the other program accessing the scanCONTROL or press the button "Next" to select another scanner. |
| Invalid device | The currently operated device is not a scanCONTROL. | Open the dialog box "Advanced scanner settings" and press the button "Next" to select a scanCONTROL or close scanCONTROL 3D-View and connect the scanCONTROL to the PC. |
| Data transfer interrupted | The data transfer between scanCONTROL and the PC has been interrupted. | Check the IEEE1394/Ethernet connection between scanCONTROL and the PC. Check if the IEEE1394/Ethernet cable is broken. Close scanCONTROL 3D-View, reconnect scanCONTROL to the PC and restart the software. |

| | | |
|---|---|---|
| Inconsistent: No. of profiles too high | The selected value for the parameter "No. of profiles" is too high. Please refer to Quick Reference scanCONTROL to get more information. | Decrease the value for the parameter "No. of profiles". |
| Inconsistent: Exposure time / No. of profiles | The selected scanner settings “Exposure time” and “No. of profiles” are mutually exclusive. | Type in consistent values for the parameters "Exposure time" and "No. of profiles" (refer to Chap. 5.1, Section 5). |
| Inconsistent: Meas. field / Points p. profile / No. of profiles | The selected scanner settings “Measuring field”, "Points per profile" and “No. of profiles” are mutually exclusive. Please refer to Quick Reference scanCONTROL to get more information. | Type in consistent values for the parameters "Measuring field", "Points per profile" and "No. of profiles". |
| Inconsistent […] | The shown scanner parameters […] are mutually exclusive. | Type in consistent values for the shown parameters […]. |
| Corrupt profile | The transferred profile is damaged. | Deactivate the filter or reset the parameters to the default settings. |
| No points in region of interest | There are no measurement points in the defined measuring field. | Enlarge the measuring field with the "Measuring field" parameter. Change the distance to the measurement object. Increase the exposure time. |
| No points in 3D-View | There are no points in the selected range for the 3D-View. | Select a valid range in the 2D-View and transfer the data to the 3D-View. |
| Ready | The system is ready to play back a profile sequence (offline mode). | There is no fault present. Select a profile file and press the Play button to play back the profile sequence. |
| Play | A profile sequence is being replayed (offline mode). | There is no fault present. Wait until the end of the playback or abort the playback using the "Stop" button. |
| Couldn’t open file | The specified name or path was incorrect. | Select the correct directory containing your recorded profile sequence. |

## 5.4 Manual Installation of the Driver for IEEE1394

### 5.4.1 Subsequent Installation of the Driver for IEEE1394 on Windows 8

If the installation of the driver wasn't completed successfully while installing 3D-View, you may install the driver subsequently.

**Note:** The driver only has to be installed for using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

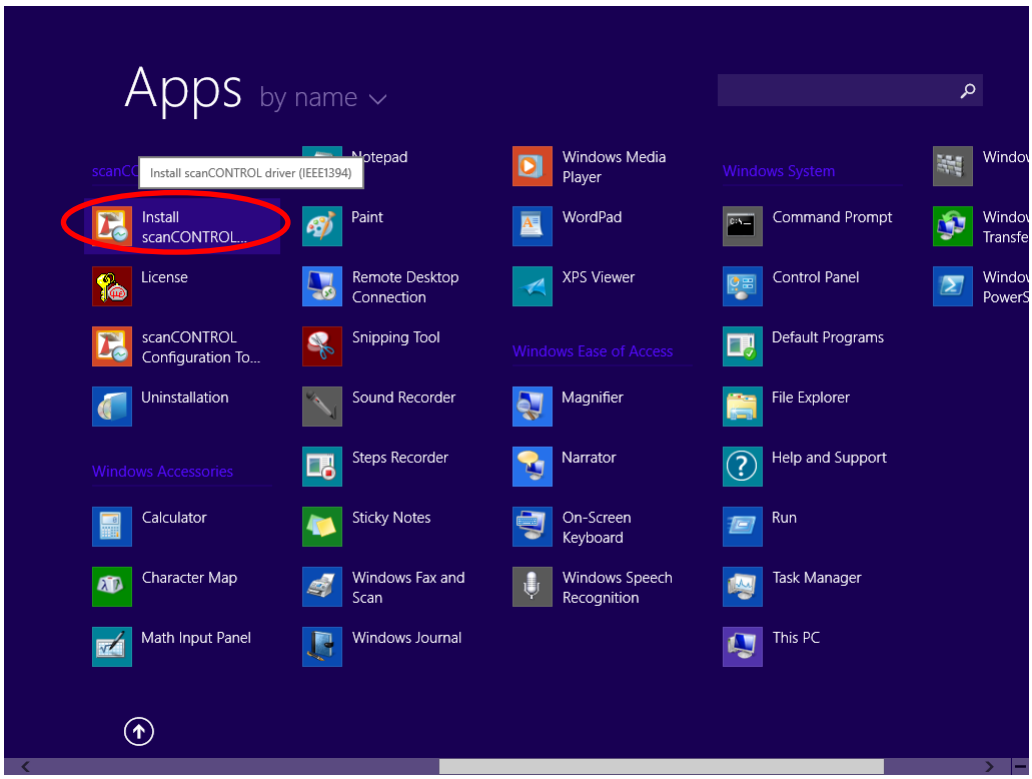


*Fig. 5.1: Windows 8 subsequent driver installation - step 1*

➡ Open the overview of your Apps and select the "Install scanCONTROL driver (IEEE1394)" App (see Fig. 5.1).

The "scanCONTROL driver (IEEE1394)" dialog will appear on the screen.

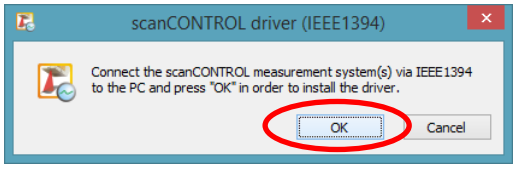
scanCONTROL driver (IEEE1394)
Connect the scanCONTROL measurement system(s) via IEEE1394 to the PC and press "OK" in order to install the driver.
OK
Cancel

*Fig. 5.2: Windows 8 subsequent driver installation - step 2*

➡ Connect scanCONTROL to the PC and click on "OK" to confirm (see Fig. 5.2).

The "Windows Security" dialog appears:

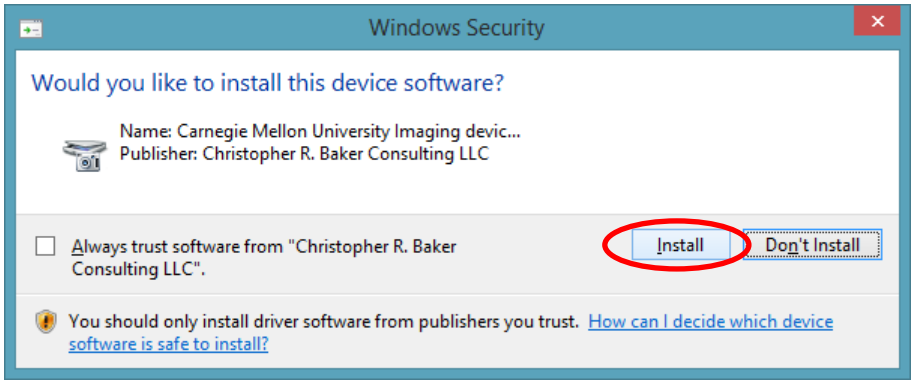
Windows Security
Would you like to install this device software?
Name: Carnegie Mellon University Imaging devic...
Publisher: Christopher R. Baker Consulting LLC
Always trust software from "Christopher R. Baker Consulting LLC".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

*Fig. 5.3: Windows 8 subsequent driver installation - step 3*

➡ Click on ”Install” to confirm this dialog (see Fig. 5.3).

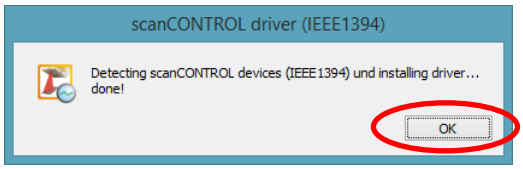


*Fig. 5.4: Windows 8 subsequent driver installation - step 4*

➥ Click on ”OK” (see Fig. 5.4).

The scanCONTROL driver is now installed.

**Note:** Only use version 6.4.6 of the CMU driver which is delivered on the CD. If a different driver or a different version of the CMU driver for scanCONTROL is installed later, it will not be possible to operate the scanCONTROL measurement system with 3D-View.

### 5.4.2 Manual Installation of the Driver for IEEE1394 on Windows 8

In case of an incorrect installation of the driver, you have to install the driver manually.

**Note:** The driver only has to be installed for using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

➥ Call up the installation dialog via the Device Manager (Windows Desktop → Charms bar → Settings → Control Panel → System and Security → System → Device Manager). scanCONTROL is located under "Imaging Devices" or under "Other Devices".

The installation dialog will then appear on the screen.

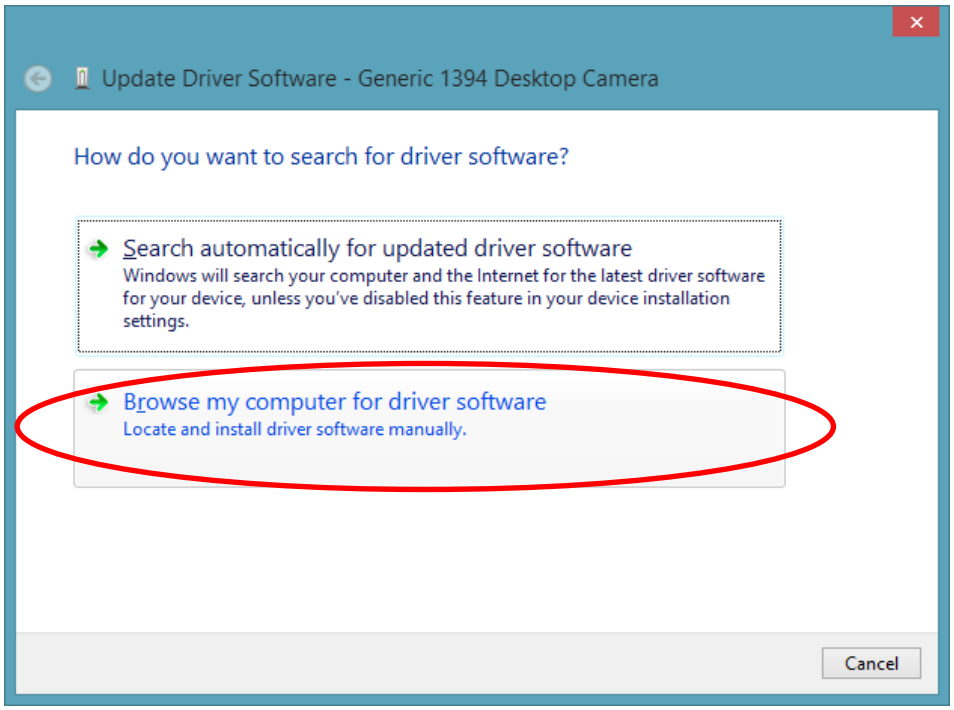
Update Driver Software - Generic 1394 Desktop Camera
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

*Fig. 5.5: Windows 8 manual driver installation - step 1*

➥ Select "Browse my computer for driver software" (see Fig. 5.5).

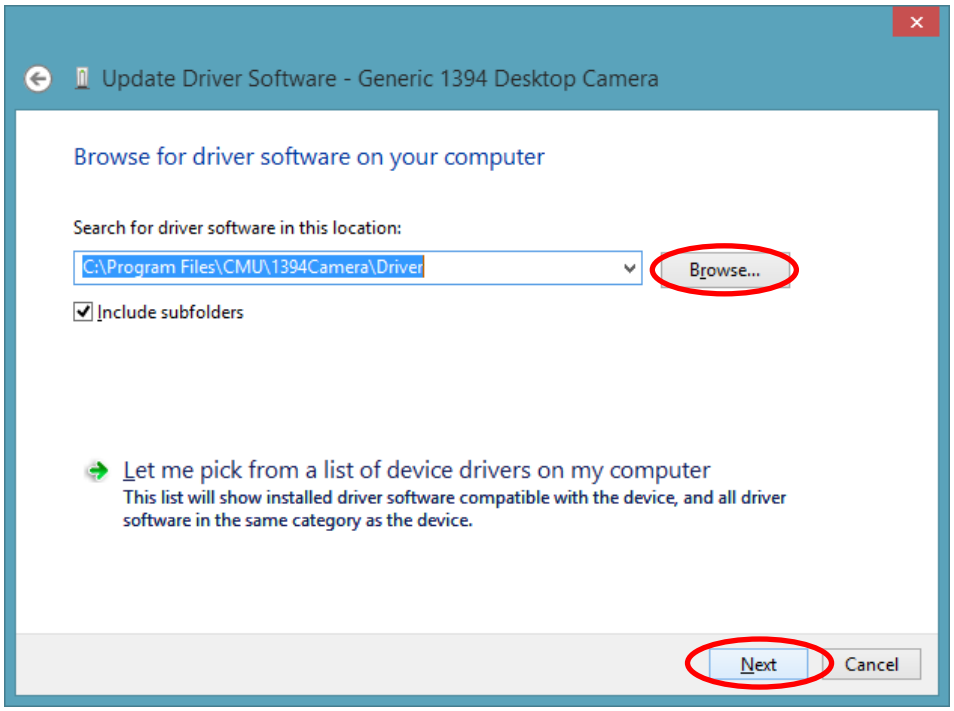
Update Driver Software - Generic 1394 Desktop Camera
Browse for driver software on your computer
Search for driver software in this location:
C:\Program Files\CMU\1394Camera\Driver
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

*Fig. 5.6: Windows 8 manual driver installation - step 2*

➡ Select "Browse…" (see Fig. 5.6).

A standard Windows dialog is displayed for the selection of the path containing the driver files.

➡ In the folder tree, select "C: → Program Files → CMU → 1394Camera → Driver" and confirm with "OK".

➡ Click on ”Next” to confirm the "Update Driver Software" dialog (see Fig. 5.6).

The "Windows Security" dialog appears:

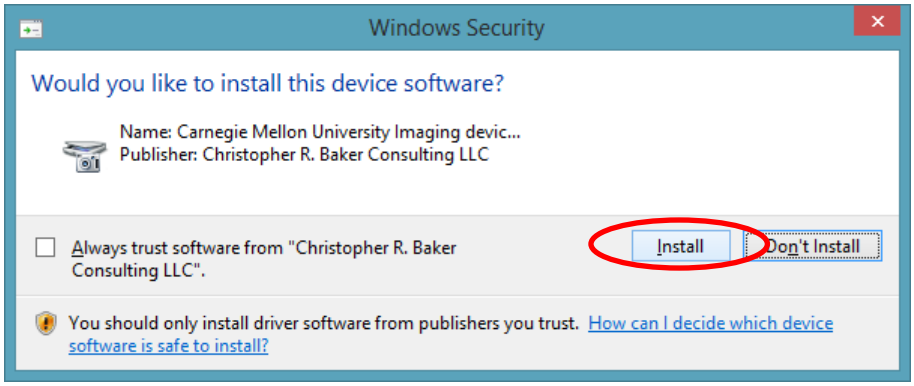
Windows Security
Would you like to install this device software?
Name: Carnegie Mellon University Imaging devic...
Publisher: Christopher R. Baker Consulting LLC
Always trust software from "Christopher R. Baker Consulting LLC".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

*Fig. 5.7: Windows 8 manual driver installation - step 3*

➡ Click on ”Install” to confirm this dialog (see Fig. 5.7).

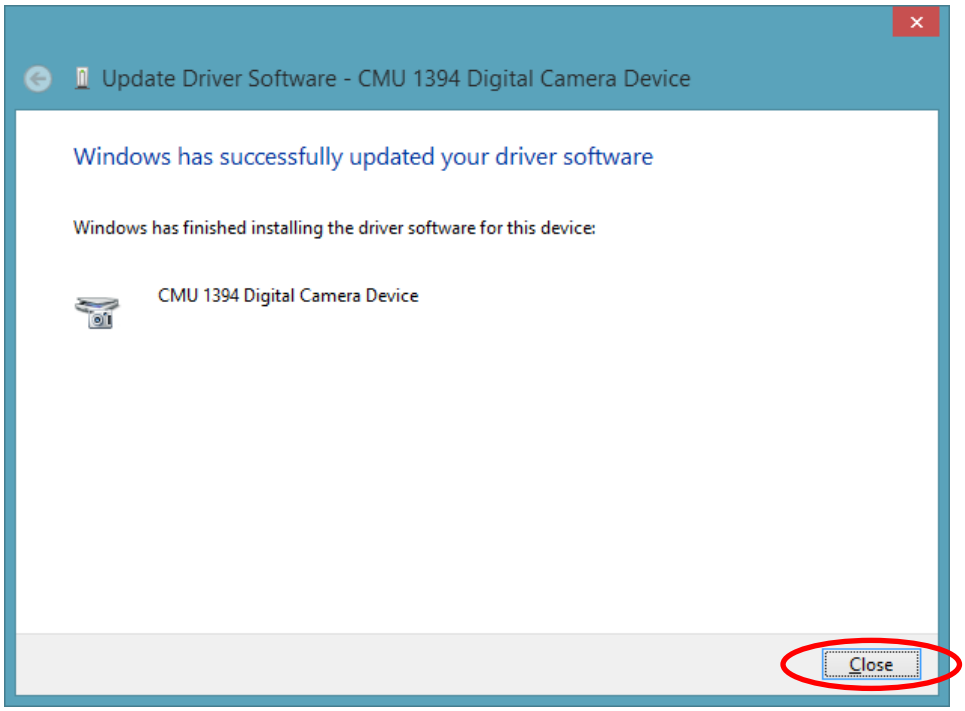
Update Driver Software - CMU 1394 Digital Camera Device
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
CMU 1394 Digital Camera Device
Close

*Fig. 5.8: Windows 8 manual driver installation - step 4*

➡ Click on ”Close” in the next dialog (see Fig. 5.8).

The scanCONTROL driver is now installed.

**Note:** Only use version 6.4.6 of the CMU driver which is delivered on the CD. If a different driver or a different version of the CMU driver for scanCONTROL is installed later, it will not be possible to operate the scanCONTROL measurement system with 3D-View.

### 5.4.3 Manual Installation of the Driver for IEEE1394 on Windows 7

In case of an incorrect installation of the driver, you have to install the driver manually.

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

➡ Call up the installation dialog via the Device Manager (Control Panel → System and Security → System → Device Manager). scanCONTROL is located under "Imaging Devices" or under "Other Devices".

The installation dialog will then appear on the screen.

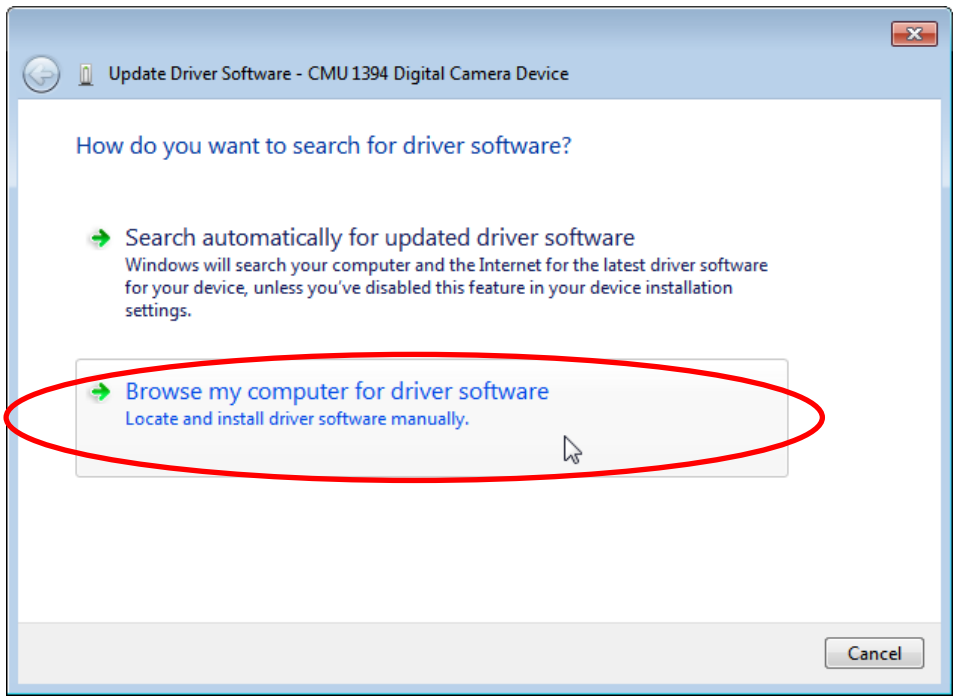
Update Driver Software - CMU 1394 Digital Camera Device
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

*Fig. 5.9: Windows 7 manual driver installation - step 1*

➡ Select "Browse my computer for driver software" (see Fig. 5.9).

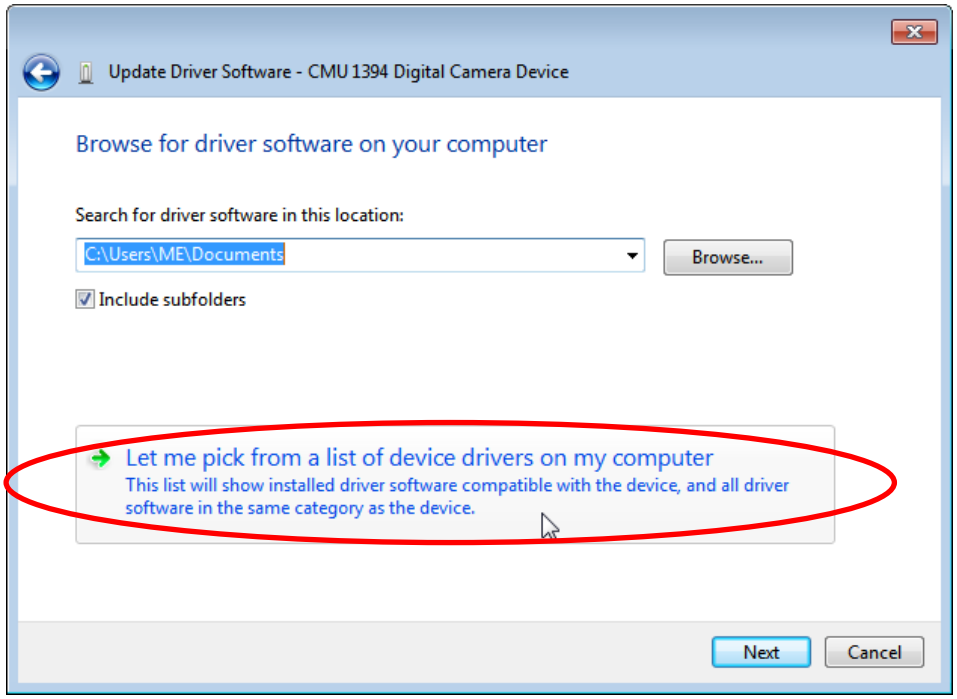
Update Driver Software - CMU 1394 Digital Camera Device
Browse for driver software on your computer
Search for driver software in this location:
C:\Users\ME\Documents
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

*Fig. 5.10: Windows 7 manual driver installation - step 2*

➡ Select "Let me pick from a list of device drivers on my computer" (see Fig. 5.10).

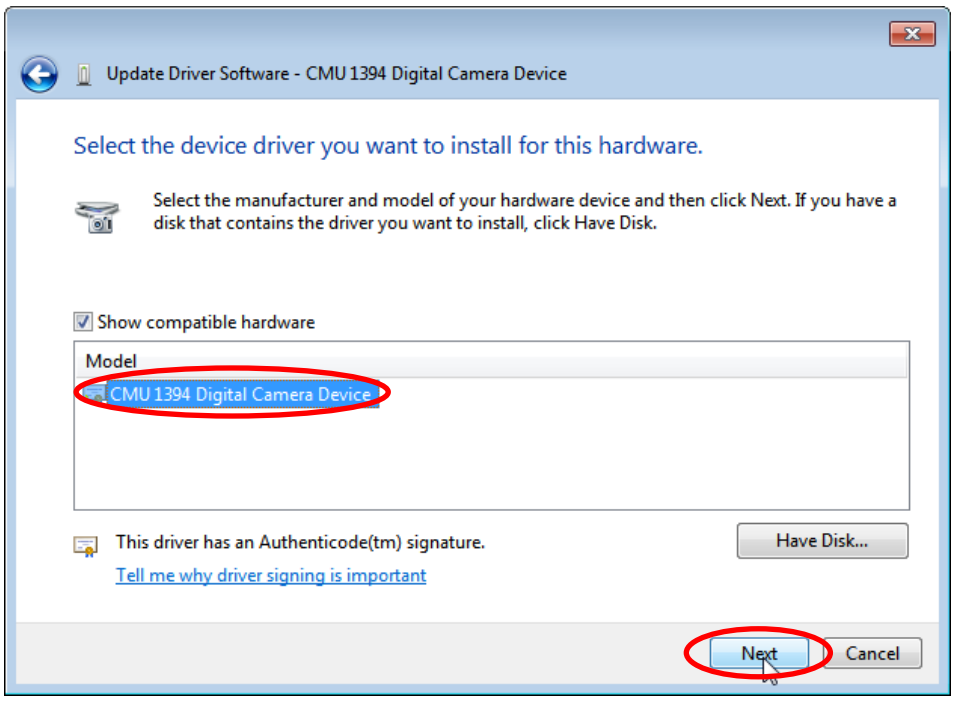
Update Driver Software - CMU 1394 Digital Camera Device
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Show compatible hardware
Model
CMU 1394 Digital Camera Device
This driver has an Authenticode(tm) signature.
Have Disk...
Tell me why driver signing is important
Next
Cancel

*Fig. 5.11: Windows 7 manual driver installation - step 3*

Select ”CMU 1394 Digital Camera Device” from the list and click on ”Next” to confirm (see Fig. 5.11).

The "Windows Security" dialog appears:

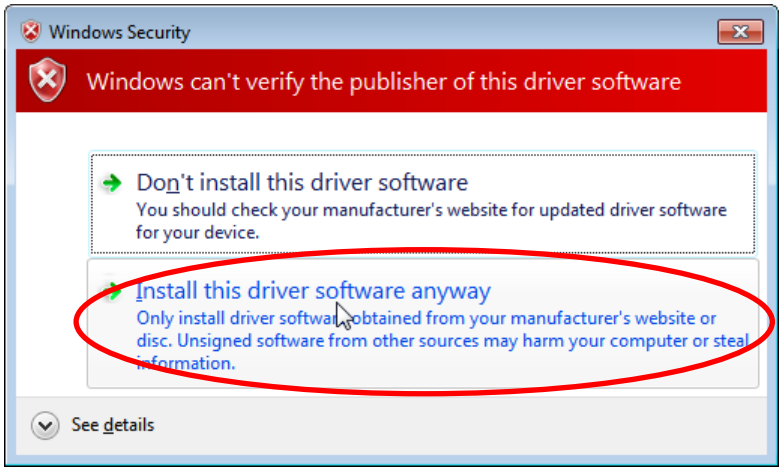
Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

*Fig. 5.12: Windows 7 manual driver installation - step 4*

Select "Install this driver software anyway" in this dialog (see Fig. 5.12).

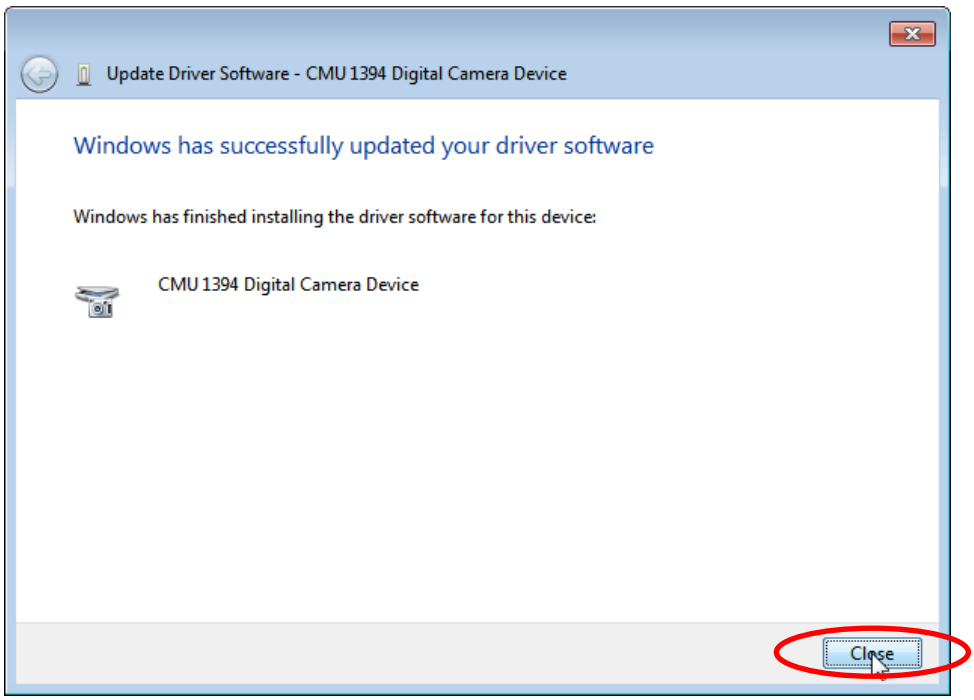
Update Driver Software - CMU 1394 Digital Camera Device
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
CMU 1394 Digital Camera Device
Close

*Fig. 5.13: Windows 7 manual driver installation - step 5*

➡ Click on ”Close” in the next dialog (see Fig. 5.13).

The scanCONTROL driver is now installed.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

**Note:** If you are requested to choose the driver files manually you will find the files in the installation directory of scanCONTROL 3D-View: *[Installation path]\Program\Driver-CMU1394*

### 5.4.4 Manual Installation of the Driver for IEEE1394 on Windows Vista

In case of an incorrect installation of the driver, you have to install the driver manually.

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

➡ Call up the installation dialog via the Device Manager (Control Panel → System and Maintenance → Device Manager). scanCONTROL is located under "Imaging Devices" or under "Other Devices".

The installation dialog will then appear on the screen.

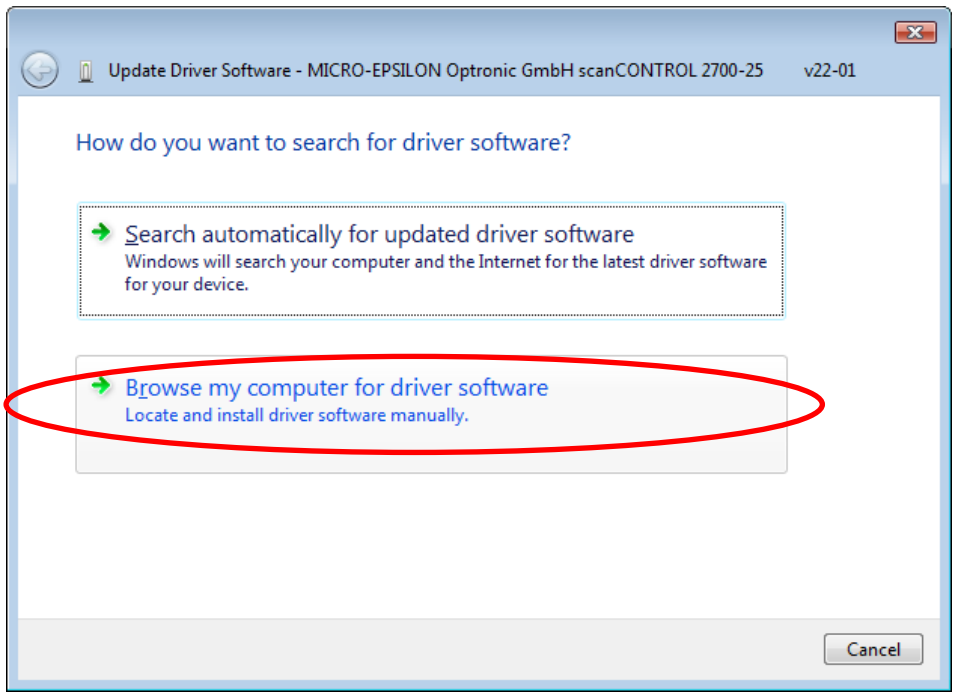
Update Driver Software - MICRO-EPSILON Optronic GmbH scanCONTROL 2700-25 v22-01
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

*Fig. 5.14: Windows Vista manual driver installation - step 1*

➡ Select "Browse my computer for driver software" (see Fig. 5.14).

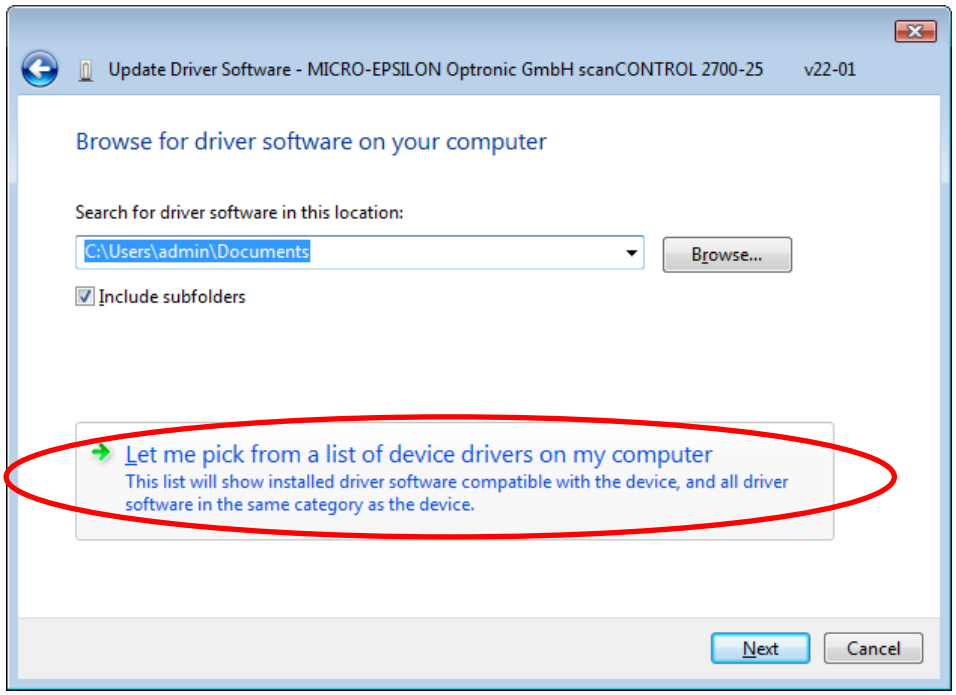
Update Driver Software - MICRO-EPSILON Optronic GmbH scanCONTROL 2700-25 v22-01
Browse for driver software on your computer
Search for driver software in this location:
C:\Users\admin\Documents
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

*Fig. 5.15: Windows Vista manual driver installation - step 2*

➡ Select "Let me pick from a list of device drivers on my computer" (see Fig. 5.15).

A driver list will then appear:

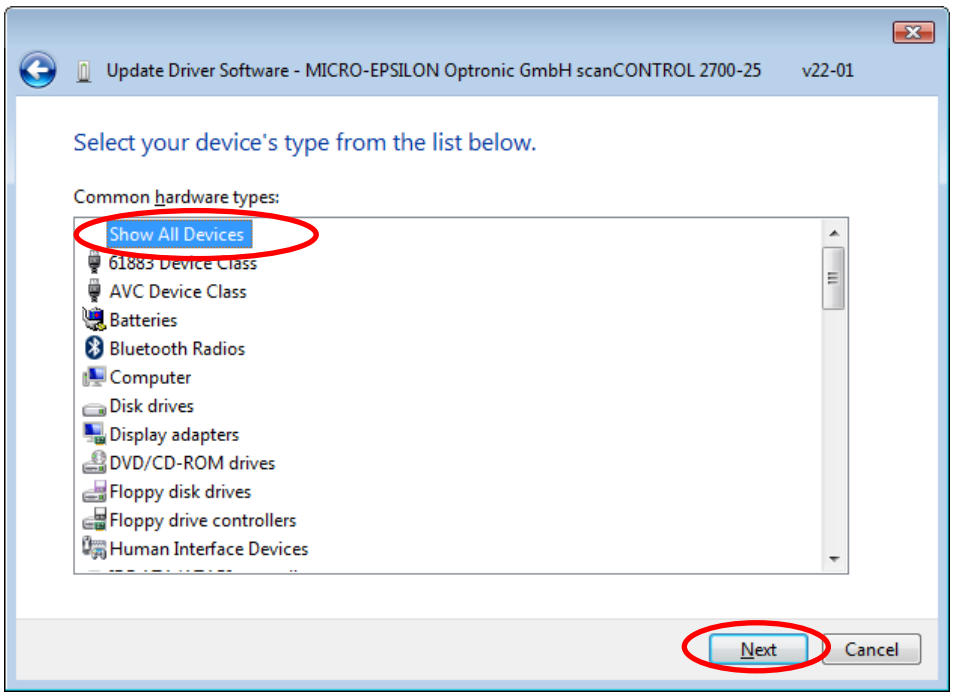


*Fig. 5.16: Windows Vista manual driver installation - step 3*

- Select "Show All Devices".
- Click on ”Next” to confirm this dialog (see Fig. 5.16).

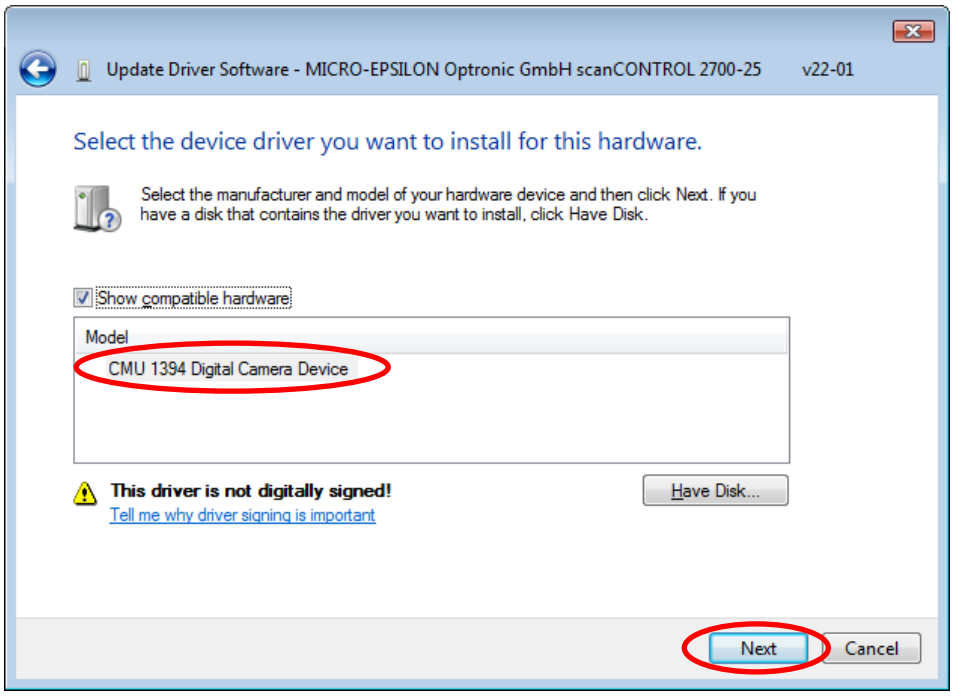
Update Driver Software - MICRO-EPSILON Optronic GmbH scanCONTROL 2700-25 v22-01
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Show compatible hardware
Model
CMU 1394 Digital Camera Device
This driver is not digitally signed!
Tell me why driver signing is important
Have Disk...
Next
Cancel

*Fig. 5.17: Windows Vista manual driver installation - step 4*

- Select ”CMU 1394 Digital Camera Device” from the list and click on ”Next” to confirm (see Fig. 5.17).

The "Windows Security" dialog appears:

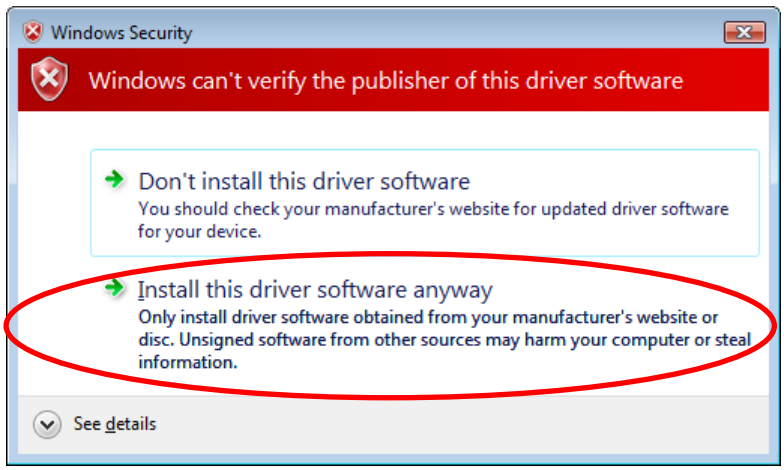
Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

*Fig. 5.18: Windows Vista manual driver installation - step 5*

➡ Select "Install this driver software anyway" in this dialog (see Fig. 5.18).

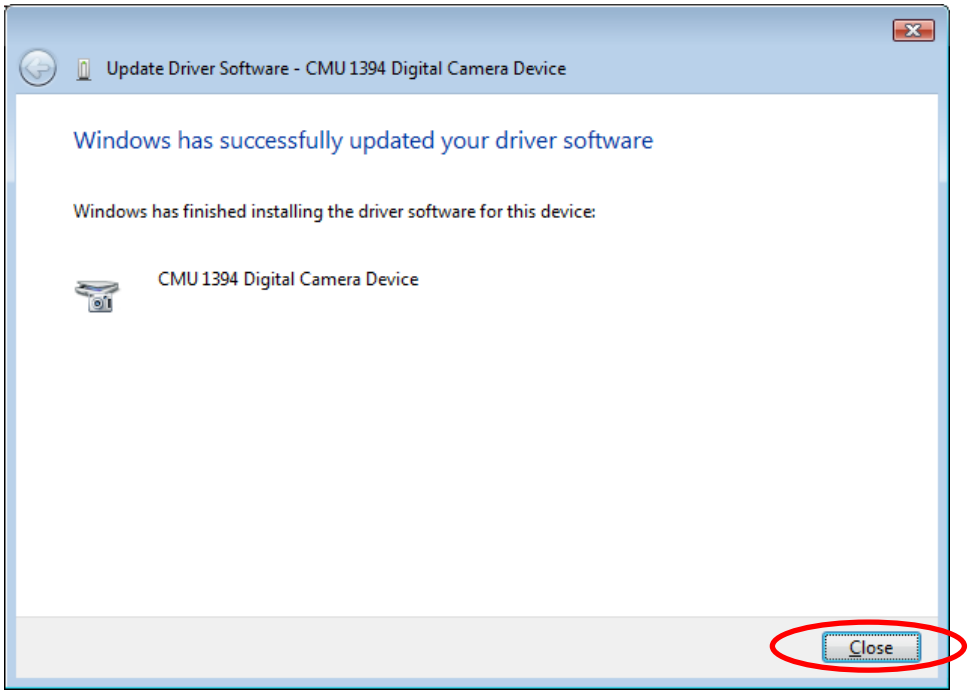
Update Driver Software - CMU 1394 Digital Camera Device
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
CMU 1394 Digital Camera Device
Close

*Fig. 5.19: Windows Vista manual driver installation - step 6*

➡ Click on ”Close” in the next dialog (see Fig. 5.19).

The scanCONTROL driver is now installed.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

**Note:** If you are requested to choose the driver files manually you will find the files in the installation directory of scanCONTROL 3D-View: *[Installation path]\Program\Driver-CMU1394*

### 5.4.5 Manual Installation of the Driver for IEEE1394 on Windows XP

In case of an incorrect installation of the driver, you have to install the driver manually.

**Note:** The driver only has to be installed with using the IEEE1394 interface. No driver is required for scanCONTROL devices with an Ethernet interface.

➡ Call up the installation dialog via the Device Manager (Control Panel → System → Hardware → Device Manager). scanCONTROL is located under "Imaging Devices" or under "Other Devices".

The "Found New Hardware Wizard" dialog will then appear on the screen.

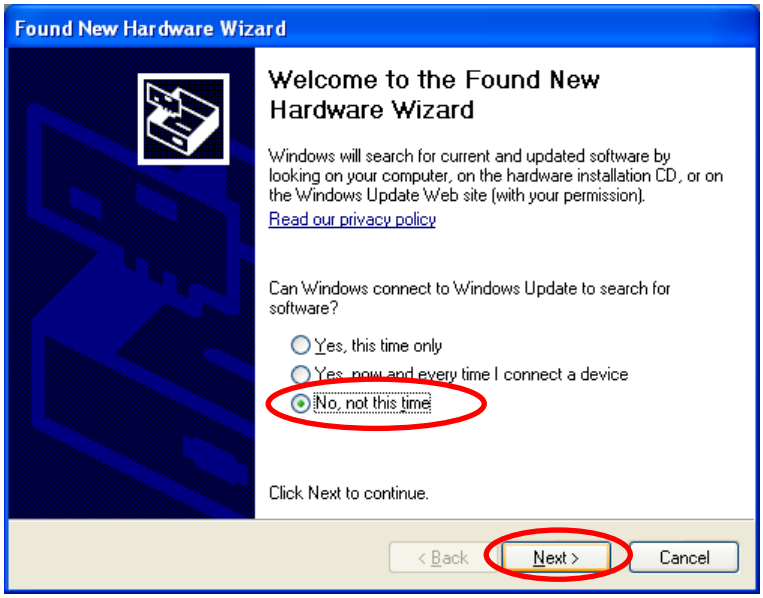
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

*Fig. 5.20: Windows XP manual driver installation - step 1*

➡ Select ”No, not this time” and click on ”Next” to confirm (see Fig. 5.20).

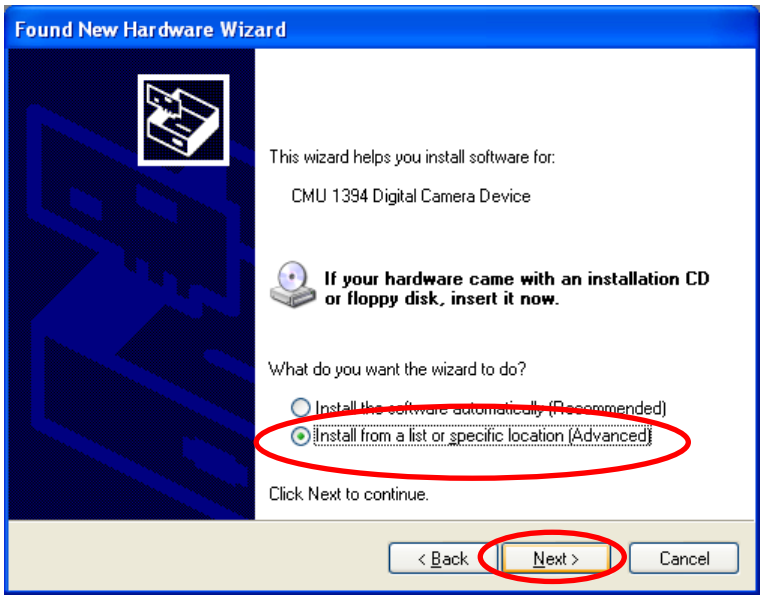
Found New Hardware Wizard
This wizard helps you install software for:
CMU 1394 Digital Camera Device
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

*Fig. 5.21: Windows XP manual driver installation - step 2*

➡ Select ”Install from a list or specific location (Advanced)”.
➡ Click on ”Next” to confirm this dialog (see Fig. 5.21).

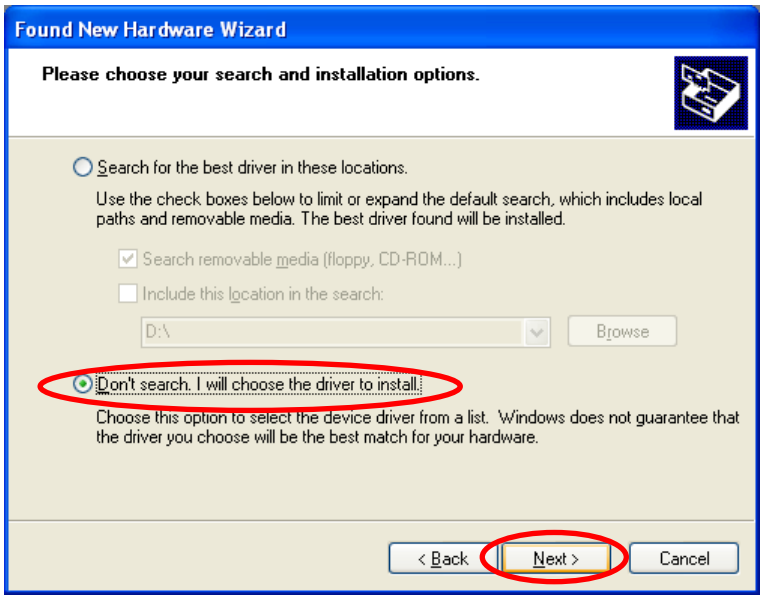
Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
D:\
Browse
Don't search. I will choose the driver to install
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

*Fig. 5.22: Windows XP manual driver installation - step 3*

- In the next dialog, select ”Don't search. I will choose the driver to install”.
- Click on ”Next” to confirm this dialog (see Fig. 5.22).

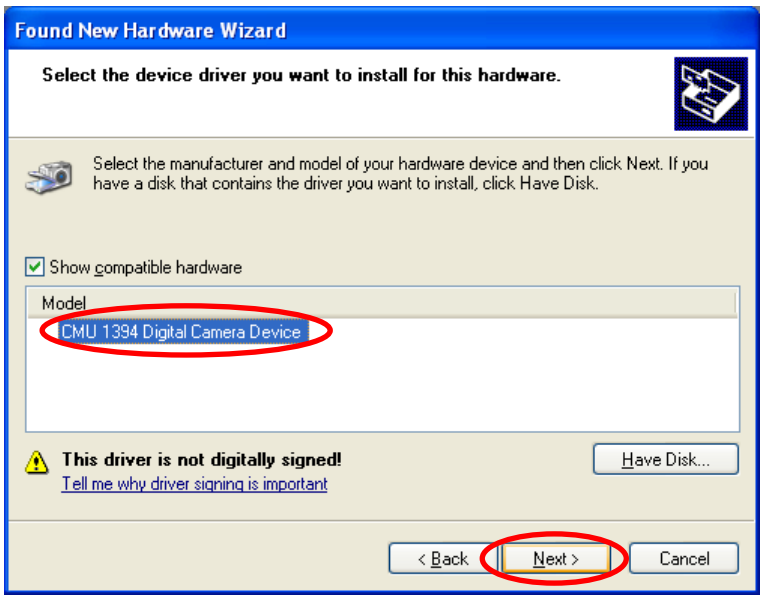
Found New Hardware Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Show compatible hardware
Model
CMU 1394 Digital Camera Device
This driver is not digitally signed!
Tell me why driver signing is important
Have Disk...
< Back
Next >
Cancel

*Fig. 5.23: Windows XP manual driver installation - step 4*

- Select ”CMU 1394 Digital Camera Device” from the list and click on ”Next” to confirm (see Fig. 5.23).

The ”Hardware installation” dialog will then appear.

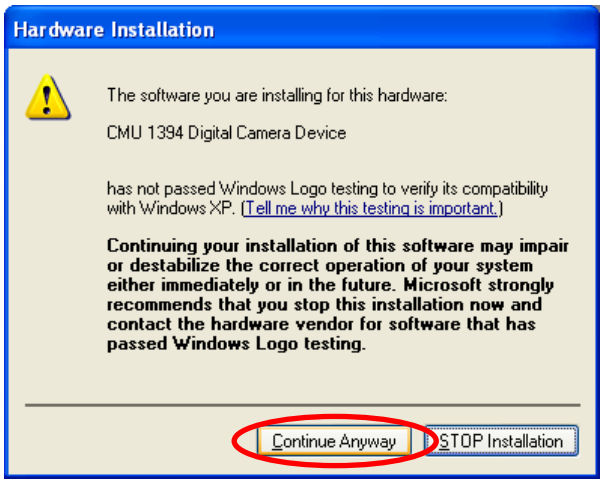
Hardware Installation
The software you are installing for this hardware:
CMU 1394 Digital Camera Device
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

*Fig. 5.24: Windows XP manual driver installation - step 5*

➡ Click on ”Continue anyway” to confirm this dialog (see Fig. 5.24).

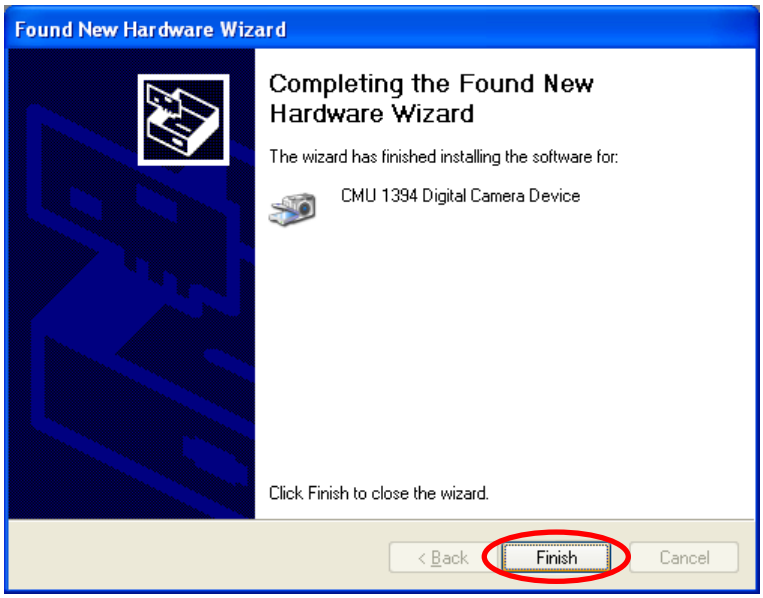
Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
CMU 1394 Digital Camera Device
Click Finish to close the wizard.
< Back
Finish
Cancel

*Fig. 5.25: Windows XP manual driver installation - step 6*

➡ Click on ”Finish” in the next dialog (see Fig. 5.25).

The scanCONTROL driver is now installed.

**Note:** Only use version 6.4.6 of the CMU driver. If a different driver or a different version of the CMU driver for scanCONTROL is installed later then it will not be possible to operate the scanCONTROL measurement system with scanCONTROL 3D-View.

**Note:** If you are requested to choose the driver files manually you will find the files in the installation directory of scanCONTROL 3D-View: *[Installation path]\Program\Driver-CMU1394*

## 5.5 Parameter Record

The following parameters are contained in a parameter record and can be loaded/saved or are restored to default settings (refer to values in brackets):

- **Main view:**
  - **Scanner settings:**
    - Exposure time (1.0 ms)
    - No. of profiles (25)
    - Buffered profiles (100)
    - Preview mode (continuous)
    - Color coding (intensity)
  - **File:**
    - Invert signal in X direction (inactive)
    - Invert signal in Z direction (active)
    - Color coding (intensity)
    - No. of profiles (inactive, 25)
  - **Display settings:**
    - Color: Auto (active)
    - Color: Min (0)
    - Color: Max (1023)
    - Z: Auto (active)
    - Z: Min (45)
    - Z: Max (615)
    - Keep aspect ratio (inactive)
- **Advanced scanner settings:**
  - Measuring field (scanCONTROL 26X0/27X0/29X0: custom, scanCONTROL 28X0: huge)
  - Custom measuring field (0)
  - Points per profile (scanCONTROL 26X0/27X0: 640, scanCONTROL 28X0: 1024, scanCONTROL 29X0: 1280)
  - Invert signal in X direction (inactive)
  - Invert signal in Z direction (active)
  - Threshold (absolute, 128)
  - Reflections (largest area)
  - Laser power (standard)
  - Switch off laser (if short circuit)
  - Auto exposure active (inactive)
  - Auto exposure mode (raw data)
  - Delay shutter (inactive)
  - Shutter alignment (right)
  - Peak Min. width (2)
  - Peak Max. width (1023)
  - Peak Min. intensity (0)
  - Peak Max. intensity (1023)
  - RS422 mode (automatic)
  - Serial baudrate (9600)
  - No RS422 termination (inactive)
  - Digital input mode (encoder + reset)
  - Digital input logic (low level logic (5V))
  - Trigger mode (internal)
  - Trigger source (RS422)
  - Encoder step (1)
  - Count positive edges/Encoder active (inactive)
  - Count negative edges (inactive)
  - Suppress backlight (active)
  - Video filter (active)
  - High resolution (active)
  - Calibration (active)
  - Packet delay (0 $\mu$s)

  - Enable CMM trigger (inactive)
  - Invert trigger output (inactive)
  - Trigger output (Port 1)
  - Trigger divisor (1)
  - Mark-space ration (1:1)
  - Skew correction (0 $\mu$s)
  - Loop back parameters (inactive)
- **Filter settings:**
  - Range (off)
  - Interpolate invalid points (active)
  - Resample all info (active)
  - Median (off)
  - Average (off)
- **3D-View:**
  - Type (boxed)
  - Show labels (active)
  - Show grid (active)
  - 2D-View (iron 2)
  - 3D-View (iron 2)
  - Background (R/G/B: 240/240/240)
  - Show out of range values (inactive)
  - Show invalid values (inactive)
  - Profiles (triangle strips)
  - Quality (normal)
  - Point size (1)
  - Enable Hardware acceleration (active)
  - Feed speed (inactive, 30 mm/s)

## 5.6 Color Palettes

The following color palettes are available for the colored texture of the 2D- and 3D-Views:

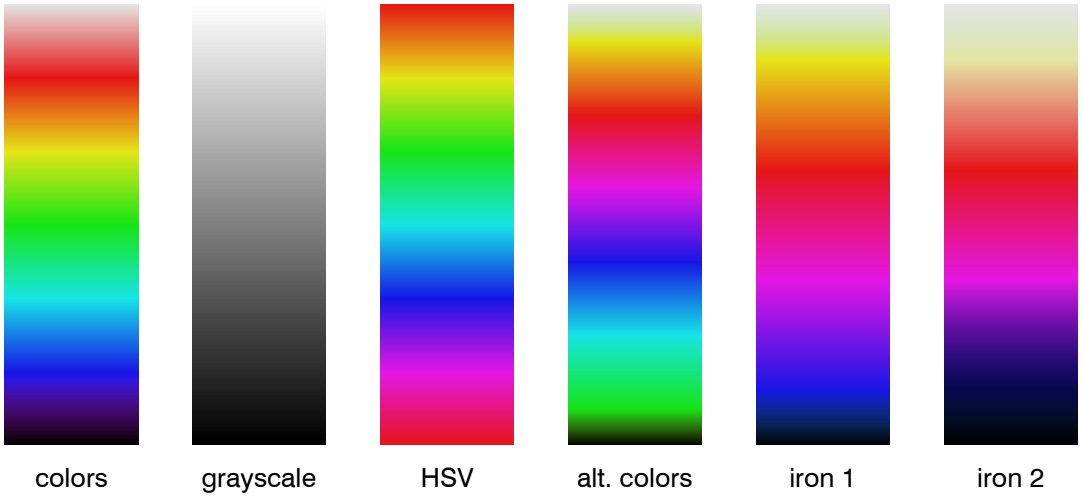


*Fig. 5.26: Color palettes for 2D- and 3D-View*

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